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NOTICE OF COPYRIGHT

The New Convention Hall

In one of the Dailies of last year we called attention to the necessity for enlarging Convention Hall and improving its arrangement. The very next day we received a letter from the representative of the Million Dollar Pier authorizing us to state that such changes would be made in time for the 1915 convention. Not only has the hall been considerably enlarged, but the arrangement of the presiding officer's desk is such that members can be seated to better advantage and will undoubtedly be able to follow the proceedings much more closely than was possible in the old hall. With the more commodius quarters and the change in the arrangement the members can move in and out between the discussions of the various reports with less disturbance to their fellows. It only remains for those taking part in the discussions to speak loudly and clearly to make this year's proceedings the very best.

This Year's Exhibit

There seemed to be an impression in some quarters that the exhibit this year would be very much smaller than usual. While it is not as large as last year, it covers over 70,000 sq. ft. of space and is in many respects more instructive and novel than any of the previous exhibits. It is doubtful if there were ever so many new appliances on exhibition in any one year. Moreover, there are more new names on the list of exhibitors than has been true for many years past. The average amount of space per exhibitor is somewhat larger than usual. The machine tool exhibit would undoubtedly have surpassed that of any previous year had it not been that the demand for certain classes of these tools has been so great, because of the manufacture of war munitions, that some of the exhibitors had to cancel arrangements for space because they could not secure a single tool for the exhibition at Atlantic City. In spite of this, however, the machine tool exhibit is every bit as attractive and practically as large as that of last year, which was a record breaker.

THE MAN AND THE JOB

A REPORT of more than ordinary interest and importance is being made by Dean Herman Schneider, of the University of Cincinnati, at the annual meeting of the National Association of Corporation Schools, which is now in session at Worcester, Mass. Probably no problem has given progressive railway officers and foremen more anxiety than that of the selection of men—and this not only for the more important or supervising positions but for each individual job on the railroad. The efficiency of a particular piece of equipment or machinery has in many cases been studied and analyzed to the last detail, but when it comes to the human element which controls the machine, the great variety of factors involved, many of them apparently indeterminate, has baffled the ingenuity of railway officers and industrial managers in trying scientifically to select and train the men to secure maximum individual efficiency.

Many officers have been attracted in the past few years

by the possibility of selecting men on the basis of an examination of their physical and other visible characteristics; others have even gone to the study of phrenology. Then, too, applied experimental psychology has seemed to many to present great possibilities for the final and logical solution of the problem. Dean Schneider, in connection with the development of co-operative engineering courses at Cincinnati, has made it his business to have a critical study made of the progress and development of each individual student, both in the practical work in the shops and in the class rooms and laboratories of the university. There are probably at least 1,000 of these young men whose characteristics are thoroughly well known and whose progress has been followed critically. In studying these men from the standpoint of physical characteristics or phrenology, Dean Schneider has been forced to the conclusion that this method of selecting men is not at all reliable, and he reaches the same conclusion regarding applied experimental psychology, which he says seems now to be where chemistry was when it was alchemy.

The final conclusion reached is that the only way by which men can be properly selected for a given job is to actually test them out on the job. Summing up, Dean Schneider finds, first, that a worker's failure is as significant as his success and should be analyzed to indicate a new and fitting job; second, the characteristics developed by analysis of many successes and failures furnish a basis for placement which works better than any known plan; third, while this method is crude and unscientific and requires a period of time much greater than the other methods proposed, it insures a reliable verdict.

THE READING TYPE LOCOMOTIVE

THE Philadelphia & Reading has on more than one occasion exhibited at the Atlantic City conventions an example of motive power designing which has aroused the keen interest of railway mechanical officers. The locomotive which this road has placed on the track exhibit at the conventions this year is of the 4-4-4 type and has been designated by the builders as the "Reading" type. A description is published in another part of this issue. While the wheel arrangement is unique, the engine has in addition a number of special features which make it by far the most interesting example of motive power designing which has been placed in service in this country for some time. Among these may be mentioned the employment of a four-wheel trailing truck which is interchangeable with the leading truck, a boiler with a firebox unusually large for passenger service, a unique design of ashpan, a cable-operated reversing mechanism, hollow axles of a design which is believed to form a precedent, the use of aluminum to reduce the weight of the reciprocating parts, and a weight on each driving axle of 73,100 lb., a figure which exceeds that of any other locomotive on our records, the nearest being that of the Pennsylvania Pacific and Atlantic type locomotives exhibited at last year's conventions, which have a weight per axle of 66,700 lb. and 66,500 lb. respectively.

A glance at the locomotive is sufficient to show that every effort has been made to keep the weight of the running gear to a minimum in order to provide as large a boiler as possible. Heat-treated steel has been used wherever possible and aluminum is used in the crosshead shoes and the main valves; the appearance of the axles, the crosshead and guides and particularly the valve gear is most striking because of the evidence of the extreme lightness of the parts employed. No figure is available for the dynamic augment, but with a weight per driving axle of 73,100 lb. this would of necessity be kept within very reasonable limits, and the appearance of the reciprocating parts indicates that nothing was left undone to keep the augment as low as possible. The design of axle employed should result, with the heat treatment, in the production of a steel of very high quality and the results obtained in service from this feature of these locomotives should prove of exceptional value to locomotive designers.

With a tractive effort of 36,600 lb., it is plain that advantage has been taken of every bit of the 146,200 lb. weight on the drivers. In fact, it would seem that the designer has gone quite to the limit in this feature when we consider that the factor of adhesion is only 3.99. The maximum tractive effort, 36,600 lb., compares with 29,500 lb. for the Pennsylvania Atlantic type locomotive, class E6s, and 41,800 lb. for the Pennsylvania Pacific type locomotive, class K4s. The driving wheel diameter, 80 in., is the same for all three of these engines and the cylinder dimensions for the Reading engine and the Pennsylvania Atlantic type are the same; but the Reading locomotive has an advantage of 35 lb. per sq. in. in boiler pressure. The maximum tractive effort of the new locomotive is exceptional for an engine having only four drivers and is as high as that of many Pacific type locomotives now in service.

For comparison with its boiler the boilers of the same two Pennsylvania locomotives have been chosen, and some of the principal features of each are shown in the accompanying table.

		Grate Area, Sq. Ft.	Heat. Surf. Sq. Ft. Firebox.	Heat. Surf. Sq. Ft. Tubes.	Heat. Surf. Sq. Ft. Equivalent.
Reading	4-4-4..	108	292	2199	3509
P. R. R.	4-4-2..	55	196	2660	3937
P. R. R.	4-6-2..	70	288	3747	5766

It will be noted that there is but little difference between the firebox heating surface of the Reading type and the Pennsylvania Pacific type, although the Pennsylvania engine has a grate area of 70 sq. ft., as against 108 sq. ft. for the Reading locomotive, the latter, of course, being an anthracite coal burner. This is probably accounted for to a considerable extent by the increase in heating surface due to the square corners of a Belpaire firebox over the curved surfaces of a Wootten firebox. When comparing the Reading locomotive with the Pennsylvania Atlantic type, the latter falls far short in firebox heating surface, but a greater number of tubes, and these 18 in. longer than those of the Reading locomotive, give the Pennsylvania engine an advantage of about 400 sq. ft. in equivalent heating surface, the latter being the total evaporative heating surface plus one and one-half times the superheating surface. Employing the system of boiler proportioning developed by F. J. Cole and now used by the American Locomotive Company, the Reading engine has about an 83 per cent boiler.

Regarding the most unusual feature of the Reading locomotive, which is the 4-4-4 wheel arrangement, little can be said until the locomotives have been tried out pretty thoroughly in service. The designer doubtless had a good reason for employing this wheel arrangement, but a first glance at the engine would lead to the belief that with what is practically equivalent to a four point suspension, it would be likely to roll considerably. This, however, as well as other effects on the riding qualities, can only be determined from service results. The four-wheel trailing truck is probably as light as, if not lighter than, some designs of two-wheel trucks, although no figures are available for this weight, but it does not seem probable that it is lighter than the best designs of two-wheel trailer trucks now employed, and there is added another pair of bearings to maintain. That the officers of the Reading have confidence in the design, however, is evident from the fact that four of these locomotives are being built and the results of their operation will be watched with more than passing interest.

PROGRAM FOR THE WEEK
MASTER MECHANICS' CONVENTION

WEDNESDAY, JUNE 9, 1915

9.30 A. M. to 1.30 P. M.

Prayer	9.30 A. M. to 9.35 A. M.
Address of President	9.35 A. M. to 9.50 A. M.
Intermission	9.50 A. M. to 9.55 A. M.
To allow those who wish to retire to do so, although all are requested to remain.	
Action on minutes of convention of 1914	9.55 A. M. to 10.00 A. M.
Reports of Secretary and Treasurer	10.00 A. M. to 10.15 A. M.
Assessment and announcement of dues; appointment of committees on correspondence, resolutions, nominations, obituaries, etc.	10.15 A. M. to 10.25 A. M.
Election of auditing committee	10.25 A. M. to 10.30 A. M.
Unfinished business	10.30 A. M. to 10.35 A. M.
New business	10.35 A. M. to 10.45 A. M.
Discussion of reports on:	
Mechanical stokers	10.45 A. M. to 11.15 A. M.
Revision of standards	11.15 A. M. to 11.45 A. M.
Safety appliances	11.45 A. M. to 12.00 M.
Topical discussions:	
(1) Advantages, if any, of compounding superheater locomotives	12.00 M. to 12.30 P. M.
(2) Side bearings on tenders	12.30 P. M. to 1.00 P. M.
Discussion of report on:	
Smoke prevention	1.00 P. M. to 1.30 P. M.

ENTERTAINMENT

11.00 A. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

3.30 P. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

9.00 P. M.—*Social Gathering and Informal Dance.* Special Feature, Costume Recital, Miss Betty Lee. Ball Room, Million-Dollar Pier. Don Richardson Orchestra.

THURSDAY, JUNE 10, 1915

9.30 A. M. to 1.30 P. M.

Discussion of reports on:	
Locomotive headlights	9.30 A. M. to 10.15 A. M.
Design, construction and inspection of locomotive boilers	10.15 A. M. to 10.30 A. M.
Standardization of tinware	10.30 A. M. to 10.45 A. M.
Superheater locomotives	10.45 A. M. to 11.30 A. M.
Fuel economy	11.30 A. M. to 12.00 M.
Individual paper on:	
Variable Exhausts. By Mr. J. Snowden Bell	12.00 M. to 12.30 P. M.
Topical discussions:	
Tender derailments, causes and remedies. To be opened by Mr. H. T. Bentley	12.30 P. M. to 12.45 P. M.
Road instructions for enginemen and firemen	12.45 P. M. to 1.00 P. M.
Cross-head design. To be opened by Mr. A. R. Ayers	1.00 P. M. to 1.30 P. M.

ENTERTAINMENT

10.30 A. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

3.30 P. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

9.30 P. M.—*Informal Dance.* Special Feature, Costume Recital, Miss Betty Lee. Ball Room, Million-Dollar Pier. Don Richardson Orchestra.

FRIDAY, JUNE 11, 1915

9.30 A. M. to 1.30 P. M.

Discussion of reports on:	
Joint meetings with M. C. B. Association	9.30 A. M. to 9.45 A. M.
Standardization of tinware	9.45 A. M. to 10.00 A. M.
Revision of air-brake and train signal instructions	10.00 A. M. to 10.15 A. M.
Train resistance and tonnage rating	10.15 A. M. to 10.30 A. M.
Locomotive counterbalancing	10.30 A. M. to 11.00 A. M.
Maintenance and operation of electrical equipment	11.00 A. M. to 11.15 A. M.
Forging specifications	11.15 A. M. to 11.30 A. M.
Boiler washing	11.30 A. M. to 11.45 A. M.
Dimensions of flange and screw couplings for injectors	11.45 A. M. to 12.00 M.
Subjects	12.00 M. to 12.05 P. M.
Resolutions, correspondence, etc.	12.05 P. M. to 12.15 P. M.
Unfinished business	12.15 P. M. to 12.30 P. M.
Election of officers, closing exercises	12.30 P. M. to 1.30 P. M.

Adjournment.

ENTERTAINMENT

10.30 A. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

3.30 P. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

9.00 P. M.—*Carnival Dance.* Special Feature, "Charlie Chaplin Fox Trot," Miss E. M. Kegel and Mr. Frank Carlin. Ball Room, Million-Dollar Pier. Don Richardson Orchestra.

ENTERTAINMENT FEATURES

Those attending the convention this year will find a number of new features in the entertainment program which will add materially to the pleasure of all. The most radical, and what bids fair to be the most appreciated change is that of holding all social gatherings and dances on the pier. The entertainment committee has arranged for the exclusive use of the entire pier on Wednesday, Thursday, Friday, Monday and Tuesday nights, only those wearing badges to be admitted.

One of the severest criticisms of Atlantic City as a meeting place has always been the fact that great difficulty has been found in keeping the crowd together. The concentrating of all entertainment features will do much toward correcting the trouble. In the past, also, the gatherings at the hotels have been much impaired because of lack of room, and the dancers especially will welcome this innovation.

The Don Richardson Orchestra will play at both the morning and afternoon concerts on the Million-Dollar Pier, as well as at the evening dances. Mr. Richardson, the leader, is a talented violinist. The orchestra, which was formed three years ago in New York City, has made a specialty of playing at private entertainments and club affairs. It has a reputation for spirited playing by its various members in special compositions, of which one or two are usually included in each of the programs. Mr. Richardson is the composer of several popular dance airs, and his orchestra was recently retained to make a number of dance records for the Columbia Graphophone Company.

Miss Betty Lee, who appears in special costume recitals at four of the informal dances, is a Southern girl, and has achieved great popularity in rendering the folklore songs of different nations. Her recitals of Southern and Japanese songs are said to be particularly good. She accompanied

the Boston Grand Opera Company on its Canadian tour last year and gave costume recitals as special numbers.

The Carnival Dance on Friday night will be one of the special attractions, and though we are not permitted to divulge the details, there are surprises in store for all.

A special vaudeville entertainment will be held in the Hippodrome on the end of the pier on Saturday night, this being the first time in five years this has been done.

The Second Annual Golf Tournament, open to members of the A. R. M. M. A., M. C. B. A., R. S. M. A. and official registered guests, will be held on June 13, at the Sea View Golf Club, further details of which will appear in The Daily.

ATTEND THE OPENING EXERCISES

The opening exercises of the Master Mechanics' Association will be held in Convention Hall at 9:30 o'clock this morning and all the convention visitors, and particularly the ladies, are invited to attend them. The enlargement of the hall has given it such an increased seating capacity that a much larger number can be accommodated than has been the case in past years, and it is hoped that the guests and more particularly the ladies will take advantage of the opportunity to be present at least at the opening session.

INFORMATION BUREAU, TICKET OFFICE AND POST OFFICE

An Information Bureau is located on the Pier adjoining the Registration Booth. In conjunction with this bureau, the Pennsylvania Railroad and the Philadelphia & Reading have established a local office where tickets and reservations may be secured.

United States mail addressed in care of the Secretary's Office, Million Dollar Pier, Atlantic City, will be taken care of and distributed direct to the exhibitors' booths.

SPECIAL TRAIN FROM CHICAGO

The Chicago M. M. and M. C. B. Pennsylvania special train, consisting of an observation car, seven sleepers, two dining cars and a combination baggage and club car, arrived at Atlantic City at 4.32 P. M. Tuesday. This train left Chicago at 5.30 P. M. Monday as second section of the Pennsylvania Limited No. 2, instead of at 3 P. M. as in former years. The train was in charge of E. K. Bixby, district passenger agent, Pennsylvania Lines.

REGISTRATION

The work of registering M.M. and M.C.B. members was started on Monday afternoon at two o'clock and since that time the booth has been pretty steadily patronized except when it was closed for short periods at the lunch and dinner hours. For the remainder of the conventions the following schedule will be followed for the registration of members and their guests:

Wednesday	(9th).....	9	to	1.30;	2	to	6	P. M.;	7	to 9 P. M.
Thursday	(10th).....	9	to	1.30;	2	to	6	P. M.;	7	to 9 P. M.
Friday	(11th).....	9	to	1.30;	2	to	6	P. M.;	7	to 9 P. M.
Saturday	(12th).....	9	to	1					5.30	to 9 P. M.
Sunday	(13th).....	10	to	12;	2	to	4	P. M.		
Monday	(14th).....	9	to	1;	2.30	to	6	P. M.		
Tuesday	(15th).....	9.30	to	12;	2	to	4.30	P. M.		
Wednesday	(16th).....	9	to	11 A. M.						

The greater number of the members of the Railway Supply Manufacturers' Association registered on Monday and Tuesday. Newcomers may register at the times shown below during the remaining days of the conventions:

Wednesday	(9th).....	9	to	12 A. M.;	1.30	to	5 P. M.; 7	to 9 P. M.
Thursday	(10th).....	9	to	12 A. M.;	1.30	to	5 P. M.	
Friday	(11th).....	9	to	12 A. M.				
Saturday	(12th).....	9	to	1 P. M.				5.30 to 9 P. M.
Sunday	(13th).....	10	to	12 A. M.				
Monday	(14th).....	9	to	12 A. M.;	2	to	5 P. M.	
Tuesday	(15th).....	9	to	12 A. M.;	2	to	5 P. M.	
Wednesday	(16th).....	9	to	11 A. M.				

The following rules, which are quite similar to those of last year and which are authorized by the M.M. and M.C.B. Associations, will govern the registration of M.M. and M.C.B. members and their guests. These will be strictly enforced:

"Badges for members of the Master Mechanics' Association, Master Car Builders' Association, or special guests, shall not be given to any but the rightful owners. No member of the Railway Supply Manufacturers' Association will be permitted to pay for or take one for delivery except upon the owner's written order, and the receiver must sign for the badge.

"No badges shall be issued to members of the Master Car Builders' Association except on the payment of a fee of $1.00. The Master Mechanics' Association and special guest badges will be issued to those entitled to them free of all charges until noon Saturday, June 12, at which time M.M. badges will be withdrawn and a charge of $1.00 will be made for all special guest badges, except that a member of the Master Mechanics' Association taking out a special guest badge and paying the fee of $1.00 will be given his M.M. badge gratis. Likewise members of the M.M. Association who are also members of the M.C.B. Association can get their M.M. badge by paying for the M.C.B. badge."

THE BADGES

Last year a radical change was made in the design of the badges; while those used this year are somewhat similar in general design they differ greatly in appearance from anything which has heretofore been used. The M.M. and M.C.B. badges have the standard enameled emblems included in the center of the badge, presenting a possibly somewhat more symmetrical appearance than the scheme which was followed last year in which the emblem was placed off center and near the upper part of the badge.

The corrugations on the outer edge of the badge, with the projection on the lower side, which carries the number, resemble somewhat a seashell in appearance, making it specially appropriate for use at Atlantic City. The Railway Supply Manufacturers' Association badge is elongated rather than circular, as it was last year, and is not so conventional. The M.M. and M.C.B. monograms on either end of the badge add to the artistic effect. For the supply men the enamel on the badges is royal blue; for the supply ladies, white; for the railroad ladies, light blue; for the complimentary men's badges, red, and for the complimentary ladies' badges, yellow.

Railway Supply Manufacturers' Association Badge

M.M. Badge

M.C.B. Badge

WOMEN EMPLOYEES OF THE RAILWAYS OF RUSSIA.—The steps recently taken to introduce women as railway workers in the United Kingdom make it interesting to note that there are between 20,000 and 30,000 women regularly employed on the Russian State railways as gatekeepers, clerks and telegraph operators.

The Railway Supply Manufacturers' Association.

The Remarkable Exhibit of Railway Appliances at the Conventions is Due to the Efforts of this Organization

The work of the Railway Supply Manufacturers' Association is so well understood by attendants at the convention that it would be superfluous to describe it in detail. When one reviews the wonderful exhibition of railway supplies and machinery and considers the vast amount of detail planning which must have been done in advance to get it all delivered to and properly arranged on the Pier, the task appears to be a stupendous one. While the exhibition is somewhat smaller than usual this year the officers of the Association are to be congratulated on the fact that in spite of the peculiar business conditions it covers about 70,000 sq. ft. of space. That officers and committee members of the Association have done some tall hustling is indicated by the large percentage of exhibitors who are at Atlantic City this year for the first time.

But the gathering together and arrangement of the exhibit is only part of the work of the Association—entertainment features must be looked after; transportation matters both as to railroads and the use of roller chairs must be given much attention; the enrollment committee must painstakingly see that several thousand attendants are properly registered and that classified printed lists of the total enrollment are issued each day; the hotel committee sees to it that arrangements are made for the accommodation of the convention attendants at the hotels; and the badge committee looks after the designing and providing of the badges. Then there is the finance committee, with the responsibilities which always rest upon such a committee, and the committee on by-laws, which studies the needs of the Association and sees that the by-laws are revised from time to time in order that the Association may do its work most effectively.

The Association is headed this year by President J. Will Johnson, general manager of the Pyle-National Electric Headlight Company, with which company he has been associated for almost 13 years, as noted in the sketch of his career which appeared in the *Daily* of June 10, 1914, page 1263. For many years Mr. Johnson has been one of the most energetic and efficient workers in the R. S. M. A. Among other positions he has been chairman of the entertainment committee, chairman of the exhibit committee and vice-president, and in all these offices did work which contributed greatly to the success of the conventions. It should be added that when there was a band he was one of the most tuneful members of it. His advancement to the office of president was an honor well earned and well deserved.

Oscar F. Ostby, vice-president of the Association, is with the Commercial Acetylene Railway Light & Signal Company, and last year was chairman of the exhibit committee of the Association. This year in addition to his duties as vice-president he is chairman of the hotel committee. An outline of his past achievements appeared in the *Daily* of June 10, 1914, page 1265.

The secretary-treasurer, John D. Conway, devotes all of his time to the affairs of the Association and has officiated as its secretary since 1910.

EXECUTIVE COMMITTEE

The executive committee is distributed over seven geographical districts as follows: First district (New England states and Canada), one member—F. M. Nellis, Westinghouse Air Brake Company, Boston, Mass. Second district (New York and New Jersey), three members—J. C. Currie, Nathan Manufacturing Company, New York City; O. F. Ostby, Commercial Acetylene Railway Light & Signal Company, New York City; and C. B. Yardley, Jr., Lubricating Metal Company, New York City. Third district (Pennsylvania), two members—P. J. Mitchell, Philip S. Justice & Co., Philadelphia; and C. E. Postlethwaite, Pressed Steel Car Company, Pittsburgh, Pa. Fourth district (Ohio, Indiana and Michigan), two members—C. F. Elliott, Acme White Lead & Color Works, Detroit, Mich.; and J. C. Whitridge, Buckeye Steel Castings Company, Columbus, Ohio. Fifth district (Illinois, Wisconsin, Iowa and Minnesota), two members—J. H. Kuhns, Republic Rubber Company, Chicago; and George H. Porter, Western Electric Company, Chicago. Sixth district (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky and Tennessee), one member—Frank E. Beal, Magnus Metal Company, Altanta, Ga. Seventh district (states west of the Mississippi river, including Louisiana, but excepting Iowa and Minnesota), one member—S. M. Dolan, Chicago Varnish Company, St. Louis, Mo.

Four of these members will automatically retire at the close of the convention, including F. M. Nellis (first district), Oscar F. Ostby (second district), J. C. Whitridge (fourth district), and S. M. Dolan (seventh district).

The four new members of the executive committee elected last year were F. E. Beal, sixth district; Philip Justice Mitchell, and C. E. Postlethwaite, third district; and George H. Porter, fifth district. Brief sketches of these new members follow:

F. E. Beal is a Wolverine, having been born in Detroit. After finishing a high school and a Detroit Business College course he entered the employ of the Fulton Iron & Engine Works in the early eighties as timekeeper. Later he was promoted to the position of assistant cashier, and then bookkeeper. This company was at that time owned by J. B. Wayne, Senator James McMillan and Congressman John S. Newbury and was engaged in the manufacture of car journal bearings under the original Hopkin's patent for lead lined bearings and saw mill machinery. Mr. Beal succeeded to the position of cashier and bookkeeper and served in that capacity until Mr. Wayne's death, when he was appointed assistant general manager, which position he held until 1902 when the company was sold to the National Fulton Brass Manufacturing Company. He was made vice-president, remaining in that position until 1905, when the business was purchased by the Magnus Metal Company. In 1907 Mr. Beal was transferred to New York City as sales manager for the Magnus Metal Company, and after serving in this position for two years was transferred in 1909 to the position of manager of shop operations and sales department of the Georgia plant of that company.

Philip Justice Mitchell was born in Philadelphia and educated at the Friends' Central High School of that city. For several years he was employed by a large banking and shipping concern, and in 1886 went with the firm of Philip S. Justice & Co., importers and dealers in railway specialties. It is said that this firm imported the first steel rails used in the United States. On the death of Philip S. Justice in 1901 Mr. Mitchell, with his father, J. Howard Mitchell, formed the partnership under the same firm name, Philip S. Justice & Co., which continued until the death of his father in 1912. In addition to conducting the business of Philip S. Justice & Co., Mr. Mitchell is treasurer of Dienelt & Eisenhardt, Inc., engineers and machinists, and treasurer of the Lovekin Pipe Expanding & Flanging Machine Company, both of Philadelphia.

George H. Porter, in charge of the steam railway sales department of the Western Electric Company, Chicago, was

R. S. M. A. Officers, Executive Committee Members and Committee Chairmen

J. H. Kuhns
Chairman, Exhibit Committee

J. Will Johnson
President

F. M. Nellis
Chairman, Finance Committee

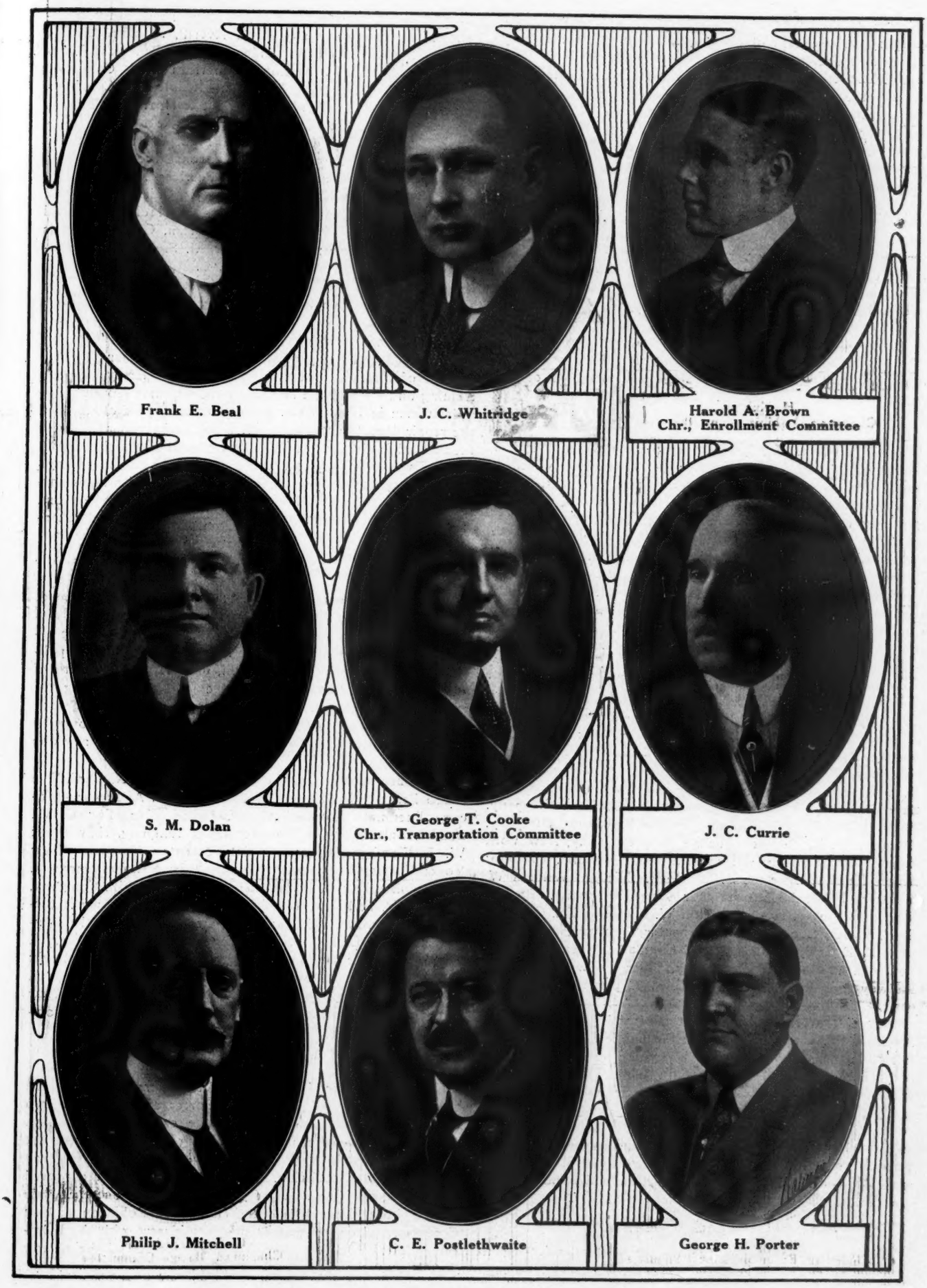
John D. Conway
Secretary-Treasurer

Oscar F. Ostby
Vice-President

C. F. Elliott
Chairman, By-Laws Committee

George R. Carr
Chairman, Entertainment Committee

C. B. Yardley, Jr.
Chairman, Badge Committee



Frank E. Beal

J. C. Whitridge

Harold A. Brown
Chr., Enrollment Committee

S. M. Dolan

George T. Cooke
Chr., Transportation Committee

J. C. Currie

Philip J. Mitchell

C. E. Postlethwaite

George H. Porter

chairman of the transportation committee at the 1914 convention; a brief sketch of his career was given in the *Daily Railway Age Gazette* of June 10, 1914, page 1265.

C. E. Postlethwaite, manager of sales for the central district for the Pressed Steel Car Company, Pittsburgh, Pa., was born in Mount Union, Huntington county, Pa., and after graduating from the Altoona high school in 1883 entered the service of the Pennsylvania Railroad, where he remained until 1890, acting successively as rodman, telegraph operator and car clerk. For the following nine years he was connected with the Norfolk & Western as chief clerk to the general superintendent and later as assistant to the general agent. He became connected with the Schoen Pressed Steel Car Company in October, 1897, shortly after the first steel freight cars were built, and remained with the company when it was merged into the Pressed Steel Car Company. He entered the sales department in February, 1902.

EXHIBIT COMMITTEE.

Joseph H. Kuhns is chairman of this committee, with J. C. Whitridge and C. E. Postlethwaite, also members of the executive committee, as the other two members.

ENTERTAINMENT COMMITTEE.

George R. Carr, vice-president of the Dearborn Chemical Company, Chicago, is chairman of this committee, which is responsible for providing the entertainment features during the convention. One of the notable features of the program this year will be the golf tournament, which is noticed at length in another part of this issue. The other members of the entertainment committee are M. G. Baker, American Vanadium Company, Pittsburgh, Pa.; E. H. Bankard, Jr., Cambria Steel Company, Chicago; Walter H. Bentley, Curtain Supply Company, Chicago; G. R. Berger, Gould Coupler Company, Chicago; B. A. Clements, Worth Brothers Company, Chicago; C. W. F. Coffin, Franklin Railway Supply Company, Chicago; J. F. A. Comstedt, Atlas Automatic Jack Corporation, New York City; T. K. Dunbar, Acme Supply Company, Chicago; C. D. Eaton, American Car & Foundry Company, St. Louis, Mo.; R. J. Faure, Commercial Acetylene Railway Light & Signal Company, New York City; J. F. Forney, Ralston Steel Car Company, Baltimore, Md.; R. H. Gwaltney, T. H. Symington Company, New York City; H. W. Hegeman, U. S. Metal & Manufacturing Company, New York City; Langley Ingraham, Yarnall Paint Company, Philadelphia, Pa.; C. D. Jenks, Edwin S. Woods Company, Chicago; W. K. Krepps, Crucible Steel Company, New York City; J. B. Landreth, Garlock Packing Company, Chicago; Albert MacRae, MacRae's Blue Book, Chicago; William W. Melcher, Massachusetts Mohair Plush Company, Boston, Mass.; Burton W. Mudge, Burton W. Mudge & Co., Chicago; G. E. Ryder, Locomotive Superheater Company, New York City; D. E. Sawyer, Illinois Steel Company, Chicago; Harold N. Scott, Griffin Wheel Company, Chicago; L. B. Sherman, Railway Age Gazette, Chicago; A. B. Wegener, Camel Company, Chicago.

George R. Carr, chairman of the committee, was born at Argenta, Ill., where he attended the public schools. In the fall of 1893 he moved to Chicago, where he has since lived and where he attended the Austin High School. He was graduated at the University of Illinois, School of Chemistry, in 1901. Immediately after graduation he entered the service of the Dearborn Chemical Company in the sales department and has been with that company in various capacities continuously since that time. He was elected vice-president and general manager in the spring of 1908, which position he now holds.

TRANSPORTATION COMMITTEE.

This committee has charge of all matters referring to transportation and is headed by George T. Cooke, Chicago Car Heating Company, New York City. The other members of the committee are E. A. Averill, Standard Stoker Company, New York; W. Anderson, The Pantasote Company, Chicago; J. T. Anthony, American Arch Company, New York; R. W. Benson, American Flexible Bolt Company, New York; C. C. Bradford, U. S. Light & Heating Company, Niagara Falls, N. Y.; D. L. Clement, Pratt & Lambert Company, New York; H. Chamberlain, Transportation Utilities Company, New York; A. N. Dugan, Bronze Metal Company, New York; L. S. Hungerford, Jr., Peerless Rubber Manufacturing Company, Chicago; A. S. Lewis, Chicago-Cleveland Car Roofing Company, New York; A. L. McNeill, Central Electric Company, Chicago; T. P. O'Brian, O. M. Edwards Company, New York; H. K. Porter, U. S. Metal & Manufacturing Company, Atlanta, Ga.; J. L. Randolph, Economy Devices Corporation, New York; C. C. Schumaker, The Carborundum Company, Chicago; L. S. Wright, National Malleable Castings Company, Chicago.

The chairman, George T. Cooke, was born in Chicago, May 28, 1883, and was graduated from the grammar and high schools of that city, after which he received a mechanical training and entered the service of the Pullman Company as a draftsman in 1901. Later he was made chief draftsman of the repair department, then chief repair inspector, and finally mechanical inspector. In 1911 he resigned his position with the Pullman Company to accept a position with the Chicago Car Heating Company as southern manager, with headquarters in Atlanta, Ga. This position he held for two years, and in 1913 was transferred to New York as eastern manager, which position he now holds.

ENROLLMENT COMMITTEE

Harold A. Brown, eastern representative of the Pocket List of Railroad Officials, New York, is chairman of this committee for the second time, having held the same position last year. A sketch of Mr. Brown's career was published in the *Daily* of June 10, 1914, page 1265. The work of the enrollment committee is most exacting, and during the past few years a considerable improvement has been made in organizing it so as to distribute it more evenly among the various members and thus not demand too much of any one of them.

The other members of the committee are F. N. Bard, The Barco Brass & Joint Company, Chicago; G. A. Barden, Chicago Pneumatic Tool Company, Philadelphia, Pa.; C. W. Beaver, Yale & Towne Manufacturing Company, New York; W. J. Fleming, Jr., Automatic Ventilator Company, New York; Charles H. Gayetty, Quaker City Rubber Company, Philadelphia, Pa.; L. D. Mitchell, Detroit Graphite Company, Chicago; R. F. Moon, Westinghouse Electric & Manufacturing Company, Philadelphia; E. T. Sawyer, Commercial Acetylene Railway Light & Signal Company, New York; F. H. Smith, Gold Car Heating & Lighting Company, New York; T. D. Starr, Wm. C. Robinson & Son Co., Philadelphia; J. A. Stevens, F. W. Devoe & C. T. Raynolds Company, New York; and H. G. Thompson, Edison Storage Battery Company, Orange, N. J.

BADGE COMMITTEE

C. B. Yardley, Jr., is chairman of this committee, of which Oscar F. Ostby and George H. Porter are the other two members, all being members of the executive committee. Mr. Yardley has been president during the past year of the Railway Materials Association, associated with the Railway Storekeepers' Association. A sketch of his career appeared on page 1266 of the *Daily* of June 10, 1914. Since that time he has been connected with William C. Robinson & Son Company, and on the first of this month went with the Lubricating Metal Company, New York, as manager of the railway department.

COMMITTEE ON BY-LAWS

C. F. Elliott is chairman of this committee, with F. E. Beal and George H. Porter as the two other members, all three being members of the executive committee.

HOTEL COMMITTEE

Oscar F. Ostby, vice-president of the Association, is chairman of this committee, with S. M. Dolan and P. J. Mitchell, both of the executive committee, as his associates.

FINANCE COMMITTEE

F. M. Nellis, who last year was chairman of the committee on by-laws, is this year chairman of the finance committee and has as his associates J. C. Currie and C. F. Elliott. A brief sketch of Mr. Nellis' career appeared in the *Daily* of June 10, 1914, page 1266.

MOTT SHERWOOD KILLED

M. E. Sherwood, master mechanic of the Michigan Central at Jackson, Mich., was shot and killed while automobile riding with his wife and a party of friends in the fair grounds at Jackson last Friday evening at 9.30 o'clock. It was at first believed that he had died of apoplexy, but examination later developed the fact that a bullet had entered the back just below the left shoulder and passed through the heart. Apparently the shot was fired by boys in the grand stand who were shooting at the lights and tires of passing automobiles. Mr. Sherwood entered the employ of the Michigan Central about 25 years ago as a mechanic and was made a master mechanic five years ago. He was 46 years of age and is survived by a widow and a son, William.

ROLLER CHAIRS

The Transportation Committee has issued the following instructions for the use of roller chairs during the conventions.

"Roller chairs will be furnished free from the following four stations at the periods noted and only to members wearing the official badges:

The Pier	9.00 A. M. to 6 P. M.
Marlborough-Blenheim	9.00 A. M. to 6 P. M.
Chalfonte Hotel	9.00 A. M. to 6 P. M.
Strand Hotel	9.00 A. M. to 6 P. M.
To both informal dances on pier	8.30 P. M. to 10 P. M.

"Unoccupied chairs may be stopped at any point on the Boardwalk, except between the Marlborough-Blenheim and the Pier, and they may be used in either direction, but must be reported at the first checking station passed. Convention chairs are not allowed to wait more than fifteen minutes.

"Any of Shill's chairs may be had after hours for a continuous trip in any one direction for 25 cents per person. Hourly riding can be arranged for on the regular rate basis. Private chairs may be secured at special rates through the Transportation Committee only."

MASTER MECHANICS' REGISTRATION

Aldcorn, Thomas, Chicago Pneumatic Tool Co.; Shelburne.
Averill, E. A., Standard Stoker Co.; Shelburne.
Babcock, W. G., M. M.; N. Y. C.; Sterling.
Barry, Frank J., M. M.; N. Y. O. & W.; Traymore.
Bentley, H. T., S. M. P. & M.; C. & N. W.; Blenheim.
Boyden, J. A., M. M.; Erie; Chalfonte.
Boyden, N. N., M. M.; Southern; Shelburne.
Boulineau, W. W., M. M.; C. of Ga.; Chalfonte.
Cole, F. J., Chief Conslt. Engr.; Amer. Loco. Co.; Blenheim.
Cooper, F. R., Supt. M. P.; Hobart Allfree Co.; Dennis.
Daley, W. W., M. M.; N. Y. O. & W.; Traymore.
Davis, John E., M. M.; Hock. Val.; Chalfonte.
Davis, Wm. P., M. M.; N. Y. C.; Sterling
Depue, G. T., Gen. Supt.; Erie; Dennis.
Dolan, S. M., Chicago Varnish Co.; Dennis.
Dooley, W. H., S. M. P.; Q. & C.; Dennis.
Endsley, Prof. L. E., Prof. of Ry. Mech. Engr.; Univ. of Pittsburgh.
Ferry, F. C., M. M.; L. H. & St. L.; Absecon.
Fetner, W. H., M. M.; C. of Ga.; Chalfonte.
Flynn, Walter H., S. M. P.; Mich. Cent.; Blenheim.
Giles, C. F., Supt. Mchy.; L. & N.; Chalfonte.
Glass, John C., M. M.; P. R. R.
Graburn, Al., M. E.; Can. Nor.; Blenheim.
Hayes, W. C., Supt. Loco. Oper.; Erie; Chalfonte.
Henderson, Geo. R. Conslt. Engr.; Galen Hall.
Hogan, C. H., A. S. M. P.; N. Y. C.; Blenheim.
Hyndman, F. T., S. M. P. & Cars, W. & L. E.; Blenheim.
James, Charles, M. M.; Erie; Dennis.
Kells, Willard, A. S. M. P.; A. C. L.; Dennis.
Kinney, M. A., S. M. P.; Hock. Val.; Traymore.
Laizure, L. H., M. M.; Erie; Alamac.
Leach, W. B., Hunt, Spiller Mfg. Co.; Blenheim.
Lewis, W. H., S. M. P.; N. & W.; Blenheim.
MacBain, D. R., S. M. P.; N. Y. C.; Blenheim.
McCarthy, M. J., S. M. P.; C. H. & D.; Blenheim.
McQuillen, J. E. Mech. Supt.; G. C. & S. F.; Traymore.
Montgomery, H., M. M.; P. R. R.; Ardmore.
Montgomery, Hugh, S. M. P.; Rutland; Dennis.
Moore, B. R., S. M. P.; D. & I. R.; Traymore.
Parish, LeGrand, American Arch Co.; Blenheim.
Parks, G. E., M. E.; Mich. Cent.; Blenheim.
Pfafflin, Louis, M. M.; Indianapolis Union.; Biscayne.
Pratt, E. W., A. S. M. P.; C. & N. W.; Blenheim.
Pratt, John G., Hunt Spiller Mfg. Co.; Dennis.
Rae, Clark H., A. S. M. P.; L. & N.; Chalfonte.
Randolph, V. C., M. M.; Erie; Alamac.
Shoemaker, H. Mech. Supt.; Bangor & Aroostook; Traymore.
Smith, P. F., Jr.; S. M. P.; Penna. Lines; Brighton.
Smith, R. D., S. M. P.; Boston & Albany; Dennis.
Sprowl, N. E., S. M. P.; A. C. L.; Chalfonte.
Riley, Geo. N.; S. M. P.; McKeesport Conn.; Blenheim.
Strauss, M. H.; M. M.; N. Y. C.; Sterling.
Symons, J. E., M. M.; C. C. & S. F.; Traymore.
Taylor, Jos. W., Secty.; A. R. M. M. Assn.; Blenheim.
Turnbull, R. J., Mech. Supt.; Mo. Pac.; Chelsea.
Wagstaff, Geo., American Arch Co.; Chalfonte.
Watson, R. B., Engr. Tests; Erie; Traymore.
Wildin, G. W., Mech. Supt.; N. Y. N. H. & H.; Chalfonte.
Wright, R. V., Managing Editor, Railway Age Gazette, Dennis.

MASTER CAR BUILDERS' REGISTRATION

Bentley, H. T., S. M. P. & M.; C. & N. W.; Blenheim.
Boyden, N. N., M. M.; Southern, Shelburne.
Dooley, W. H., S. M. P.; Q. & C.; Dennis.
Endsley, Prof. L. E., Prof. of Ry. Mech. Engr.; University of Pittsburgh, Chalfonte.
Ferry, F. C., M. M.; L. H. & St. L.; Absecon.
Flynn, Walter M., S. M. P.; Mich. Cent.; Blenheim.
Giles, C. F., Supt. Mchy.; L. & N.; Chalfonte.
Graburn, A. L., M. E.; Can. Nor.; Blenheim.
Grimm, E. B., Ch. Draftsman, N. P.; Dennis.
Hyndman, E. T., S. M. P. & Cars, W. L. E.; Blenheim.
Justus, I. J., Ch. Car Insp.; N. Y. C.; Blenheim.
Kells, Williard, A. G. S. M. P.; A. C. L.; Dennis.
Kinney, M. A., S. M. P.; Hock. Val.; Traymore.
Lewis, W. H., S. M. P.; N. & W.; Blenheim.
MacBain, D. H., S. M. P.; N. Y. C.; Blenheim.
McQuillen, J. E., Mech. Supt., G. C. & S. F.; Traymore.
Montgomery, Hugh, S. M. P.; Rutland, Dennis.
Moore, B. R., S. M. P.; D. & I. R.; Traymore.
Pratt, E. W., A. S. M. P.; C. & N. W.; Blenheim.
Rae, Clark H., A. S. M. P.; L. & N.; Chalfonte.
Shoemaker, H., Mech. Supt. Bangor & Aroostook, Traymore.
Smith, P. F., Jr.; S. M. P.; Pa. Lines, Brighton.
Smith, R. D., S. M. P.; Boston & Albany, Dennis.
Taylor, Jos. W., Secty., M. C. B. Assn.; Blenheim.
Turnbull, R. J., Mech. Supt.; Mo. Pac.; Chelsea.
Wildin, G. W., Mech. Supt. N. Y., N. H. & H.; Chalfonte.
Wright, R. V., Managing Editor Railway Age Gazette, Dennis.

SPECIAL GUESTS

Alleman, C. W., Supt. of Stores, P. & L. E.; Overbrook.
Bell, J. Snowden, Wiltshire.
Boring, T. J., M. P. Insp., P. R. R.; Arlington.
Chambers, Andrew, Retired Engr.
Coe, C. W., Supt.; W. & L. E.; Blenheim.
Crosby, R. M., Gen. M. M.; N. P.; Dennis.
Ferry, Miller, Absecon.
Gibson, J. A. B., M. E.; R. F. & P.; Blenheim.
Grimm, E. L., Ch. Draftsman, N. P.; Dennis.
Healey, J. M., Atl. City Press.
Kadel, B. W., Draftsman, M. P. Dept. N. & W., Maryland.
Kilpatrick, H. F., Chalfonte.
Merrill, Arthur J., Secty; S. & S. W. Ry. Club, Dennis.

Moody, W. O., M. E. I C., Shoreham.
Oakes, C. E., M. E.; K. C. So.; Craig Hall.
Steinmeyer, C. S., Asst. Engr.; Monongahela Con., Strand.
Storey, J. W., C. D., C. of Ga.; Arlington.
Wightman, D. A., Dennis.

THE GOLF TOURNAMENT

The second annual golf tournament, open to members of the A.R.M.M.A., M.C.B.A., R.S.M.A., and official registered guests, will be held on June 13 at the Sea View Golf Club. The tournament will consist of two contests run simultaneously, one an 18-hole Medal Play Handicap, the other an 18-hole Kickers Handicap. Loving cups will be presented to the three low men in each contest.

The winning score in the Kickers Handicap will be between 71 and 76 inclusive. Each participant in this tournament will have the privilege of selecting his own handicap prior to starting, with a view of securing a net score from 71 to 76 inclusive. Net scores under or over 71 to 76 respectively will be disqualified. In case of ties in either the 18-hole Medal Play Handicap

Reproduction of the Golf Tournament Poster

or in the 18-hole Kickers Handicap additional rounds will be played by those who are tied, either on Monday, June 14, or Tuesday, June 15, at the Sea View Golf Club.

The Sea View Golf Club is a private course, and it is through the personal invitation of its President, Clarence H. Geist, that our associations are privileged to hold the tournament there. No entrance fees for the tournament will be charged by the Association, but the club will levy the usual greens fee of $1.00 per day per person.

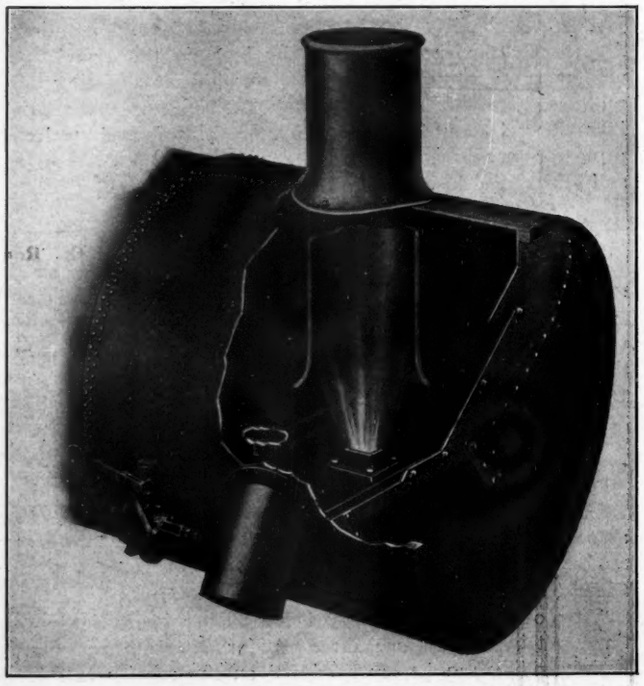
Entries for both tournaments can be made to any of the members of the golf committee, prior to June 13, or can be made at the first tee on June 13, prior to starting. The golf committee consists of E. H. Bankard, Jr., chairman; L. B. Sherman, C. D. Jenks, D. E. Sawyer, H. N. Scott, M. G. Baker, R. H. Gwaltney, and C. R. King.

In order that adequate luncheon preparations may be made at the club Sunday noon, the manager of the Sea View Golf Club has been advised that between 75 and 100 golfers will probably have luncheon there. It will therefore be wise to make reservations for tables, etc., as early as possible.

The Bergdoll Taxicab Company has agreed to take any number of persons up to six in a car to the Sea View Golf Club and return for $5.00. If the party requests a layover, a charge of $2.00 for each hour of the layover will be added to the round trip rate. The golf committee suggests that in order to make transportation to and from the club as economical as practicable, those desiring to play golf shall make up parties of six or less in advance, and the taxicab company will deliver its cars wherever it is instructed to.

RECTANGULAR EXHAUST NOZZLE

The illustration shows a rectangular exhaust nozzle which is being exhibited by the Economy Devices Corporation. This nozzle is claimed to produce a jet, the gas entraining surface of which is increased 20 per cent over that of the circular nozzle having an equivalent area, the production of draft being thus increased without resort to bridges or other obstruction which impede the flow of steam and result in



Rectangular Exhaust Nozzle

increased back pressure. It is also claimed that the jet formed by this nozzle is better adapted to fill the stack under all conditions than the usual jet of circular section. Under ordinary operating conditions the horsepower required to produce draft often forms a considerable portion of the total output of the engine and any means whereby the necessary draft may be produced with a decreased back pressure may be expected to result in a saving in fuel consumption.

CHILEAN RAILWAY CONSTRUCTION.—The following railways are in course of construction in Chile at the present time: Iquique-Pintados, 842 men, beginning excavation; Rancagua-Donihue, 60 men, rail laying completed; Alcones-Pichilemu, 217 men, grading; Linares-Colbun, 69 men, grading; Pinto-Recinto, 88 men, track is laid; Confluencia to Tome and Penco, 1079 men, track is laid to kilometer 78; Selva Oscura-Curacautin, 129 men, grading; Cajon-Llaima, 155 men, track laid to kilometer 52.5.

A Passenger Locomotive of Unusual Interest

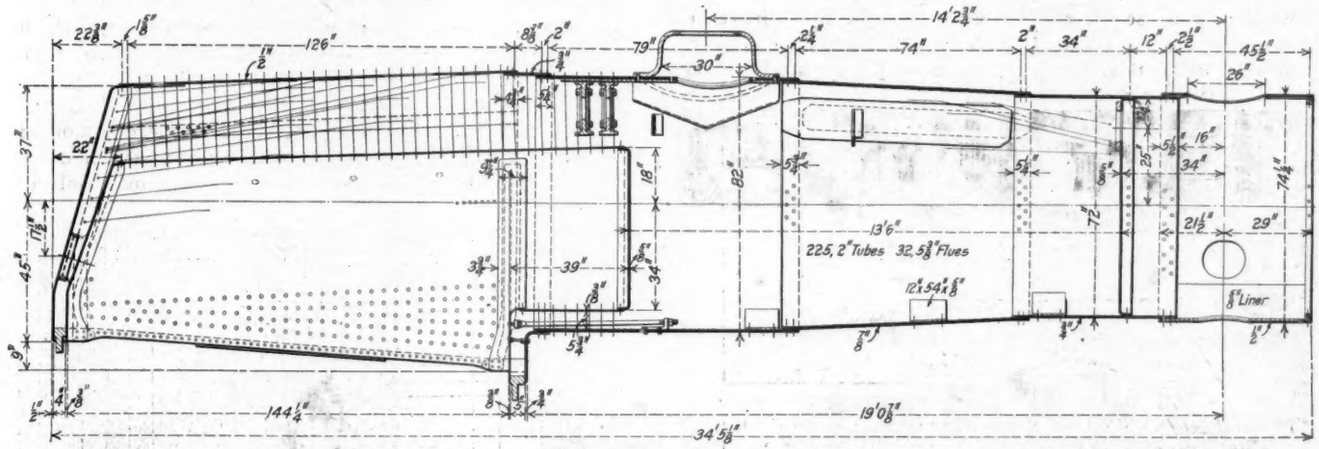
New Reading Engine of the 4-4-4 Type Has a Weight of 73,000 lb. per Driving Axle; Large Firebox Heating Surface

The Philadelphia & Reading has on exhibition at the conventions a locomotive of a new type, which has been designated as the "Reading" type, and has a 4-4-4 wheel arrangement, a four-wheel truck being employed under the firebox. This truck is interchangeable with the leading truck. The locomotive is the first of four which were designed and are being built at the company's shops at Reading, Pa., for heavy, fast passenger service.

These engines have a number of interesting and unusual features, apart from the wheel arrangement. These include a special design of back frame and ashpan, hallow axles with an unusual amount of metal removed from the centers, a cable-operated reverse gear and a weight on drivers of 146,200 lb., or 73,100 lb. per axle. Heat-treated steel has been liberally employed to reduce weight, and aluminum was resorted to for this purpose in the crossheads and some other parts.

A back frame is placed longitudinally under the central portion of the firebox. This frame is constructed of two rolled plates 1 in. by 30 in. by 16 ft. 9¼in., flanged to a pulling casting to its back end. This back frame provides a passage-way for a reversing cable and piping, five lines of piping passing through it.

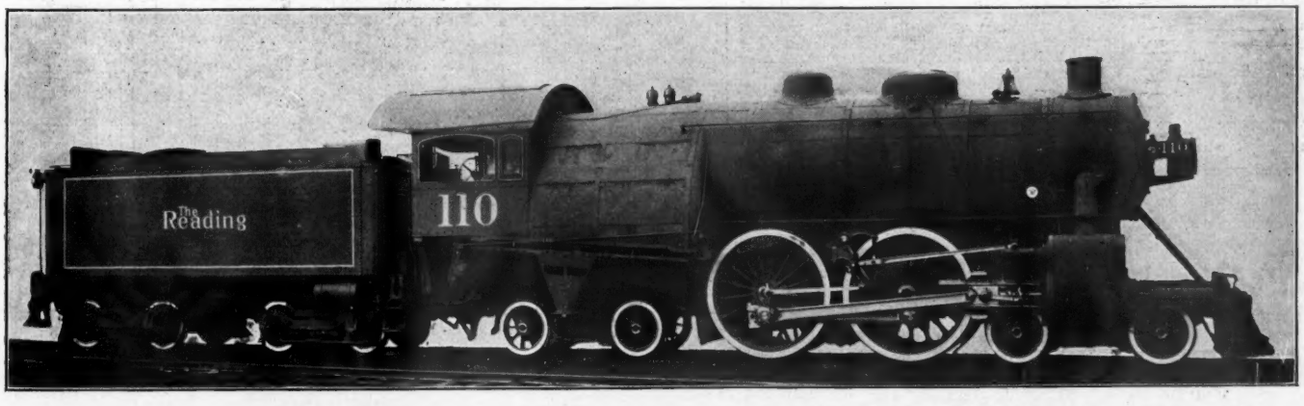
Three conical ashpans are provided on each side of the locomotive, giving large, self-cleaning receptacles, which also provide ample air openings at a considerable distance below the grates. Flatly flaring sides, where ashes can collect, are eliminated. The middle pans on each side catch the light rakings, which, in emptying the pans, can be dropped to the side of the track outside the rails, or deflected between the rails into the pit, by means of a short chute. The front and back pans receive the fire and ashes from the front and back drop-grates, when the fires are cleaned, and discharge it into the pit between the rails, ahead of and behind the truck.



The Boiler of the Reading 4-4-4 Type Locomotive

A rear cab arrangement of ample dimensions is combined with a very wide Wootten type firebox, for burning anthracite coal, without creating excessive weight at the rear of the locomotive. This permits the engineman and fireman to be together.

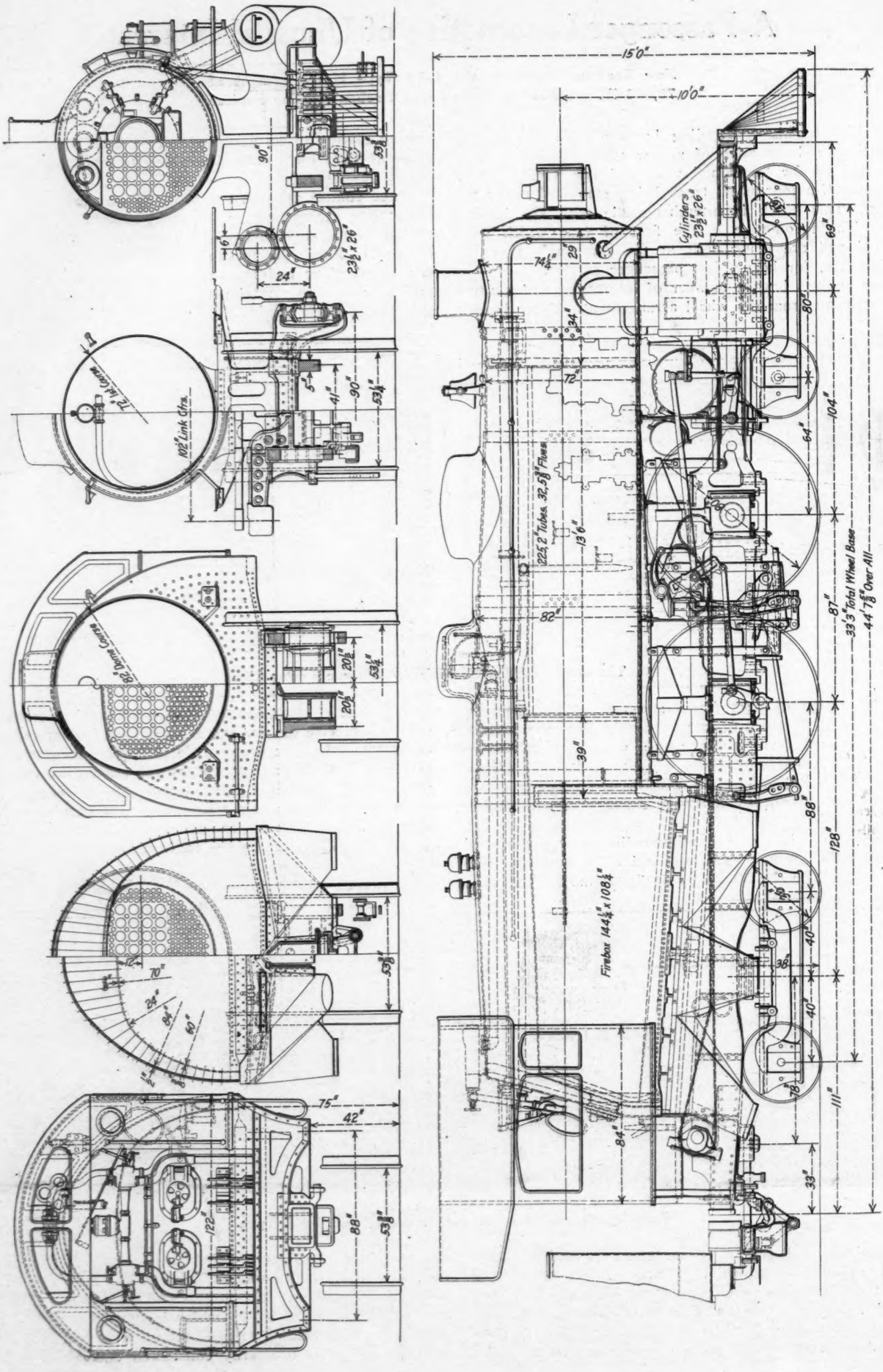
The firebox and grate surface is probably the largest of



Passenger Locomotive of the "Reading" or 4-4-4 Type

suitable shape and spaced 10 in. apart by spacers of a channel section, to which they are riveted. The main frames terminate under the front of the firebox, where they are tied together by means of a cross-brace casting, into which the back central frame is fastened. A center plate is riveted under the middle portion of the back frame, and a

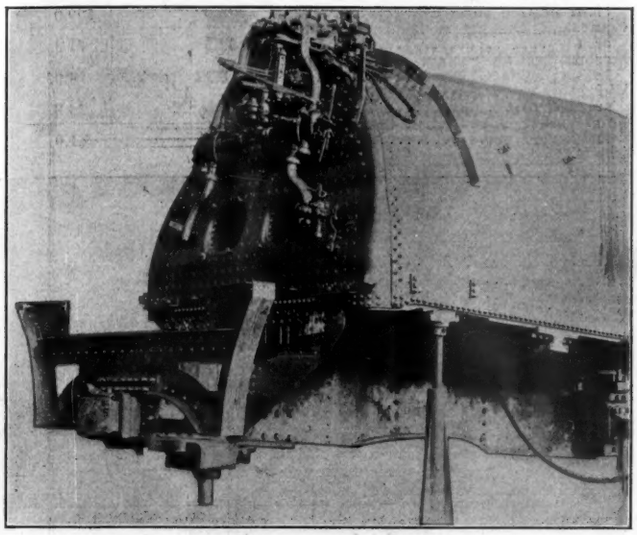
the prevailing types ever applied to a passenger locomotive, and, with a few exceptions, as large as any ever applied to a freight locomotive. The firebox and combustion chamber heating surface is 292 sq. ft., which is equivalent to 8.32 per cent of the total heating surface. As a square foot of firebox heating surface is ordinarily considered equivalent to five



Elevation and Sections Showing General Arrangement of the Reading 4-4-4 Type Locomotive

or six square feet of tube heating surface, ample steaming capacity is expected from the boiler.

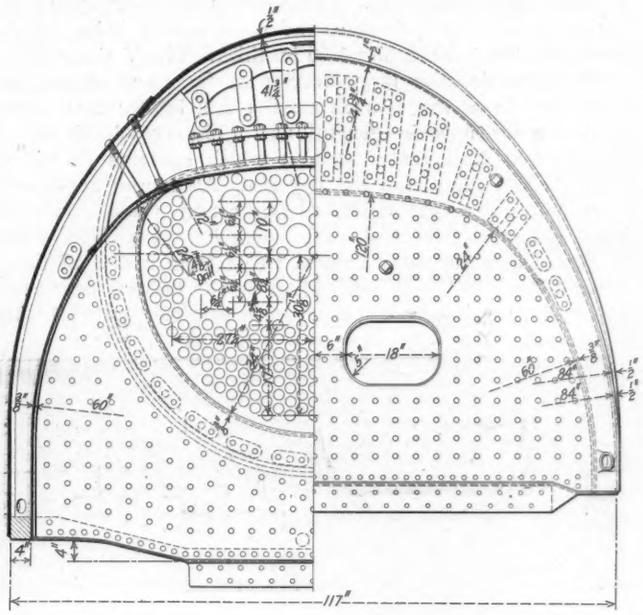
This large firebox is of advantage in burning low grades of anthracite coal. The 9 ft. by 12 ft. grate gives one square foot of grate for every 32.5 sq. ft. of heating surface in the boiler, which approximately equals what is considered good practice for stationary work in burning anthracite coal. This large proportion of grate surface to heating surface should also be advantageous in burning low grades of bituminous coal.



Firebox and Back Frame During Construction

An anti-clinker device provides for the introduction of steam to the ashpan under the grates from the exhaust cavity of the cylinders and from the air pump, with means in the cab for turning this steam supply either under the grates or into the locomotive stack. This device assists the burning of low grade coal which runs together forming clinker and thus interferes with the operating of the grates and the working of the fire.

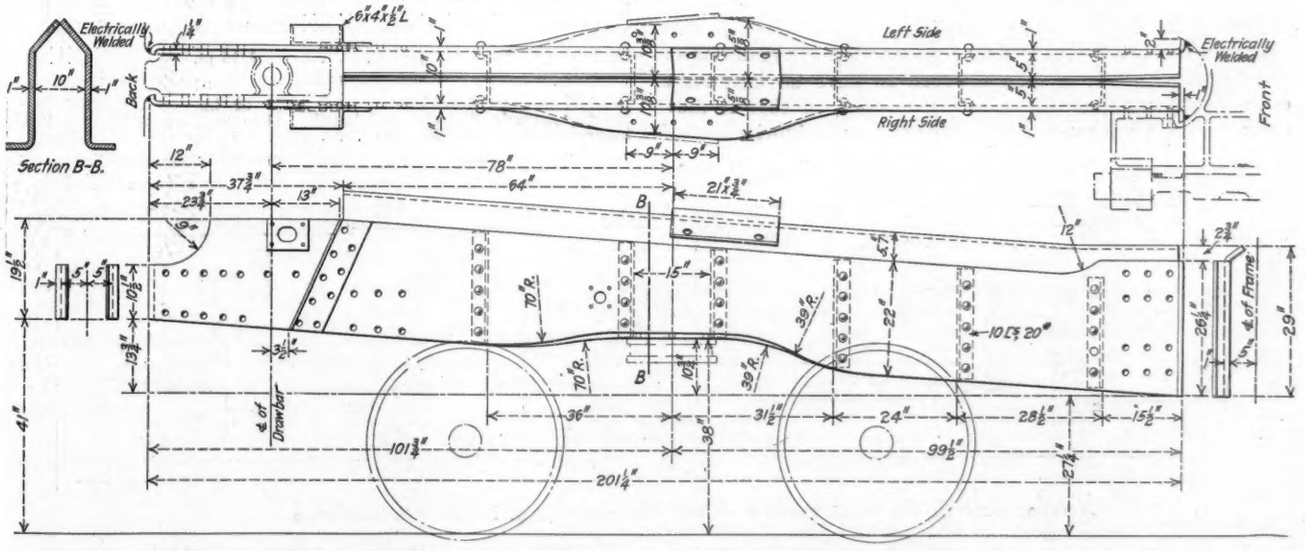
A special study has been made to obtain lightness in every part of the locomotive, so that all available weight could be put into the boiler. All castings and forgings have been designed with this in view. Heat-treated steel and high-grade materials have been used, with the result that this locomotive has a larger boiler than any other passenger locomotive now in service on the Reading, while at the same time the total weight of the locomotive is less than that of some engines of other types now in heavy passenger service; nevertheless, a greater weight is carried on the drivers, the result being a comparatively light but powerful locomotive with a large boiler capacity.



Cross Section and End Elevation of the Reading Locomotive Boiler

Mayari chromium-nickel heat-treated steel is used in the following parts: main and side rods, driving and engine truck axles, main crosshead guides, piston-rod-extension guides, crosshead centers, pistons and piston rods, valve motion parts, and a number of minor parts where special strength was required with a minimum of metal. Aluminum is used for the main crosshead shoes, crosshead for piston-rod-extension, main steam valves, valve-stem crosshead, hand reversing wheel, cab window frames and smokebox door clips.

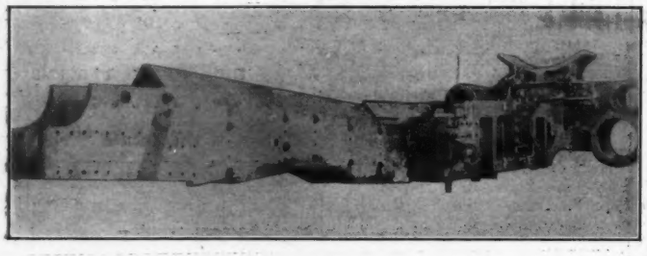
Hollow driving and engine truck axles are used. The main driving axles have 6-in. holes, and the engine truck axles



Details of the Back Frame for the Reading Locomotive

3½-in. holes, which is much in excess of anything heretofore used. This feature lightens the parts and greatly assists in the heat treatment of the metal.

V-shaped guides are used for the crossheads and piston-rod-extension crossheads. These guides are made from bent plates of heat-treated steel, the main guides being ½ in. thick and the front guides 3-16 in. thick. The V shape gives a strong guide with large bearing surface, and allows the crosshead to be made much smaller and lighter than other constructions now in general use. The crosshead has a heat-treated steel center portion which contains the wrist pin hole and the piston rod key slot. Aluminum upper and lower shoes are cast solidly to this center, these aluminum shoes being provided with babbitt wearing faces. The piston is forged and turned to conical shape from a disc of heat-treated steel, and it is believed to be the lightest ever used for high pressure and heavy service. The web of this



The Assembled Frames

piston tapers from 5-16 in. thick, where it joins the outer rim, to ½ in. thick where it joins the center.

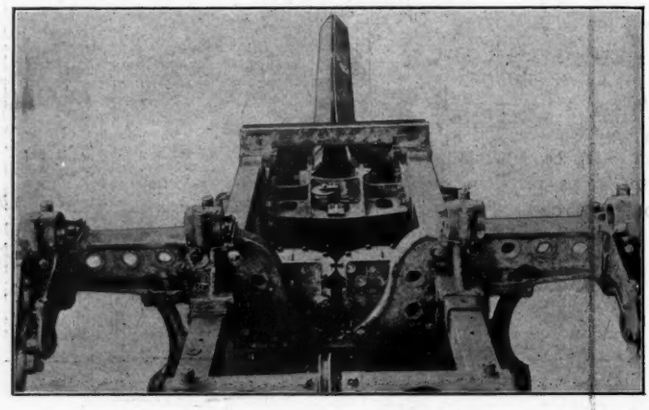
The reciprocating parts, throughout, are very light. This allows a great weight to be carried on the driving wheels without creating excessive loads at the higher speeds.

A hand wheel is used to operate a cable reversing mechanism connected to the tumbling shaft. A 7-16 in. steel cable runs through the duct formed by the back frame, from a drum under the cab to an arcuated lever on the tumbling shaft. A counterbalance is attached to this cable, to balance the weight of the lifted parts. An advantage is claimed for this cable mechanism over the ordinary reverse lever, in that it moves the valves easily under all operating conditions of the locomotive. It is also believed to have an advantage over the power-operated reversing devices, in that it indicates to the engineman the condition of the lubrication of the main steam valves, as it becomes hard to operate when the valves are dry.

The following table gives the principal data for the Reading 4-4-4 type locomotive and the Pennsylvania 4-4-2 type, class E6s:

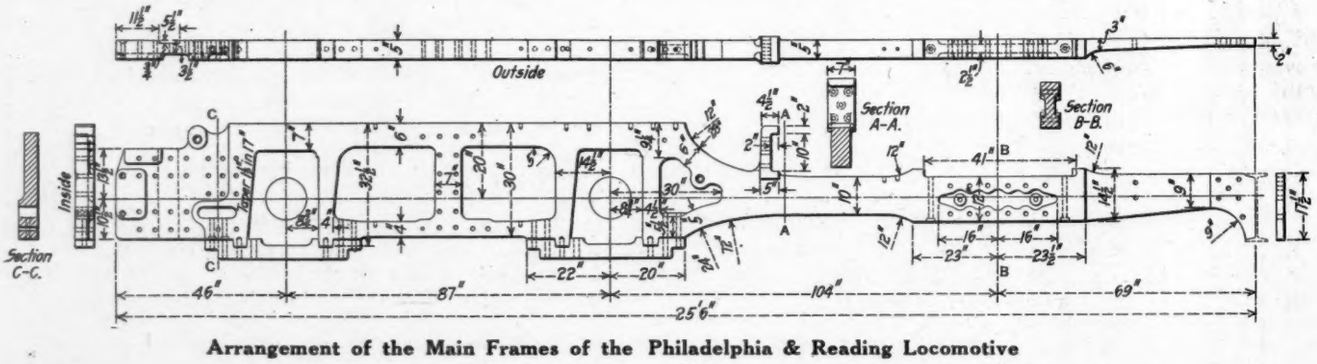
General Data

	Reading 4-4-4	Penn. 4-4-2
Gage	4 ft. 8½ in.	4 ft. 9 in.
Service	Pass.	Pass.
Fuel	Hard coal	Bit. coal
Tractive effort	36,600 lb.	29,500 lb.
Weight in working order	230,800 lb.	240,000 lb.
Weight on drivers	146,200 lb.	133,100 lb.
Weight on leading truck	28,800 lb.	55,000 lb.
Weight on trailing truck	55,800 lb.	51,900 lb.
Weight of engine and tender in working order	390,800 lb.	398,000 lb.
Wheel base, driving	7 ft. 3 in.	7 ft. 5 in.
Wheel base, total	33 ft. 3 in.	29 ft. 7½ in.
Wheel base, engine and tender	63 ft. 1⅜ in.	63 ft. 10½ in.
Ratios		
Weight on drivers ÷ tractive effort	3.99	4.52
Total weight ÷ tractive effort	6.30	8.15
Tractive effort × diam. drivers ÷ equivalent heating surface*	835.0	599.0
Equivalent heating surface* ÷ grate area	32.5	71.3
Firebox heating surface ÷ equivalent heating surface,* per cent	8.32	4.93
Weight on drivers ÷ equivalent heating surface*	41.6	33.8
Total weight ÷ equivalent heating surface*	65.8	61.0



Frame Arrangement Looking Toward the Rear

Volume both cylinders, cu. ft.	13.1	13.1
Equivalent heating surface* ÷ vol. cylinders	268	300
Grate area ÷ vol. cylinders	8.24	4.21
Cylinders		
Kind	Simple	Simple
Diameter and stroke	23½ in. by 26 in.	23½ in. by 26 in.
Valves		
Kind	Piston	Piston
Diameter	13 in.	12 in.
Greatest travel	7 in.	7 in.
Outside lap	1⅛ in.	1 5/16 in.
Inside clearance	¼ in.	.....
Lead in full gear	5/16 in.	.....
Wheels		
Driving, diameter over tires	80 in.	80 in.
Driving journals, diameter and length.	11 in. × 14 in.	9 ½ in. × 13 in.
Engine truck wheels, diameter	36 in.	36 in.



Arrangement of the Main Frames of the Philadelphia & Reading Locomotive

Engine truck journals, diameter and length	6½ in. × 13 in.	5½ in. x 10 in.
Trailing truck wheels, diameter	36 in.	50 in.
Trailing truck journals, diameter and length	6½ in. x 13 in.	....
Boiler		
Style	Wootten	Belpaire
Working pressure	240 lb.	205 lb.
Outside diameter of first ring	72 in.	78½ in.
Firebox, length and width	144¼ in. x 108¼ in.	72 in. × 110½ in.
Firebox plates, thickness	⅜ in.	⅜ in. & 5/16 in.
Firebox, water space	5 in.	5 in.
Tubes, number and outside diameter	225–2 in.	242–2 in.

Flues, number and outside diameter....	32–5¾ in.	36–5⅜ in.
Tubes and flues, length	13 ft. 6 in.	15 ft.
Heating surface, tubes and flues	2199 sq. ft.	2660 sq. ft.
Heating surface, firebox	292 sq. ft.	195.7 sq. ft.
Heating surface, total	2491 sq. ft.	2856.2 sq. ft.
Superheater heating surface	679 sq. ft.	721.0 sq. ft.
Equivalent heating surface*	3509 sq. ft.	3937.7 sq. ft.
Grate area	108 sq. ft.	55.1 sq. ft.
Smokestack, height above rail	15 ft. 0 in.	14 ft. 11⅞ in.
Center of boiler above rail	10 ft. 0 in.	9 ft. 10 in.
Tender		
Frame	12 in. channels	....
Weight	160,000 lb.	158,000 lb.
Wheels, diameter	36 in.	36 in.
Journals, diameter and length	5¾ in. × 10½ in.	5½ in. × 10 in.
Water capacity	8,000 gal.	7,000 gal.
Coal capacity	12 tons	13 tons

*Equivalent heating surface = total evaporative heating surface + 1.5 times the superheating surface.

EXCEEDING THE SCHEDULE

Secretary Joe Taylor has lots of trouble keeping the convention sessions up to the program schedule. It is just as bad to run too fast as too slow. Railroads are sometimes worried with this same problem of keeping the trains from running too fast. An instance of this sort is described in the following letter which was recently received by the general claim agent of a southern road:

"Repleighing to your leter the 29 Beg to say we ar awair of the fack that X and Y dus not run fas enuf to endangur the life of a hog when it is runing skedul, but i am in possisshun to pruve that the trane maid a extrey effurt tow ketch this animule and exscyded ther spead limet having thur advantatige of the po hog by its being down graid the hog dun all in hets power to eskape but was overtucked by the enjine en put to deth. so i shal cuntend for the value of this animule as it is noan hear that the X and Y dus not pay for enything in thur weigh of stoc if it can avoyd so i am tuning this over to My atturneigh unles setle by return male."

LITTLE INTERVIEWS

J. Will Johnson, president of the Railway Supply Manufacturers' Association, remarked yesterday that the most marked tendency which he had noted during the ten years that he has been coming to the conventions, has been a growing disposition on the part of both the railway men and the supply men to make the conventions and the exhibits more efficient along purely business lines. "In the first place," said Mr. Johnson, "the railway men themselves have taken the conventions, and especially the exhibits, more and more seriously. The effect of this has been that the supply men have taken more pains to make their exhibits worth while. The proportion of improved devices or entirely new ones shown has increased until many concerns exhibit practically no others. The entertainment features have been modified until they occupy a very subordinate place as compared with the one they formerly occupied. The supply men co-operate together better than ever before, there being a better realization year by year that it is important to make not only the individual exhibits, but the exhibit as a whole, interesting and instructive. While the space used is reduced this year, owing to conditions with which all are familiar, I believe that the exhibit will be found to be at least as good as any we have ever had."

THE SWISS HAUENSTEIN BASE TUNNEL.—For a time, work on the Hauenstein Base Tunnel, the contractors for which are a German firm in Berlin, was interrupted, largely owing to the workmen having been called away to erect fortifications on the top of the range beneath which the tunnel runs. This having been accomplished, the men have been allowed to resume work on the tunnel, which is now completely excavated and which is expected to be lined by the end of May, the date of the opening having been provisionally fixed by the Swiss Federal Railways for October, 1915.

Conventionalities

J. W. Fogg, formerly master mechanic of the Baltimore & Ohio Chicago Terminal, comes to the convention this year for the first time in the guise of a supplyman. He is selling Boss nuts to all the "bosses" now.

W. O. Moody, mechanical engineer of the Illinois Central, with Mrs. Moody and friend, Miss Josephine Whalen, arrived Monday for the week. This is Mrs. Moody's first visit to the conventions. Mr. Moody reports a total of 75 locomotives and 1000 cars ordered by his road so far in 1915. Evidently the I. C. officers are no pessimists.

E. R. Hibbard, president of the Grip Nut Company, Chicago, will not be able to attend the convention this year. He, however, will be represented by his son Howard Hibbard, who this year for the first assumes the duties of official representative of his father's company.

Those many friends of "Tom" Dunbar of the Acme Supply Co., will be sorry to learn that owing to a recent operation for appendicitis in San Francisco he will be unable to attend

F. T. Hyndman, Superintendent Motive Power and Cars, Wheeling & Lake Erie

the conventions this year. We are glad, however, to report that he is well on the road to recovery, though for a time his condition was serious, this being his third operation.

C. D. Jenks, general manager for Edwin S. Woods & Company of Chicago, will be unable to attend the convention this year. He has had a serious case of iritis and his physician advises him to remain at home. His condition is improving. H. M. Perry of the same company, who has attended these conventions for many years, is here.

W. H. Cook, our genial English friend who has so well represented the Fastnut, Ltd., of London, was prevented at the last moment from visiting the conventions this year. He had booked passage on the Philadelphia, but owing to the sinking of the Lusitania, the berths were all taken, and furthermore, there seemed great difficulty about getting back, as it appeared that he would not be able to return to England until late in July.

G. W. Wildin, mechanical superintendent of the New York, New Haven & Hartford, Mrs. Wildin and their niece, Miss Josephine Fish, were among the arrivals on Tuesday. Mr.

Wildin was unable to get to the conventions last year because of a press of work in the car department, but says he hopes to be left in peace this year till both meetings are over.

George W. Lyndon, president of the Association of Manufacturers of Chilled Iron Car Wheels, made the trip to the conventions by easy stages. He came from Chicago to Pittsburgh, where he spent one night, and then to Philadelphia, where he spent another night. Last year Mr. Lyndon was accompanied to the conventions by his three daughters, but he is alone this year.

W. H. Lewis, superintendent of motive power of the Norfolk & Western and D. A. Wightman, formerly superintendent of the Pittsburgh Locomotive Works, were engaged in a fanning contest in the entrance hall on Tuesday while discussing old times. Mr. Lewis has been a member of the Master Mechanics' Association since 1876 and Mr. Wightman since 1878.

Dick Sawyer, of the Commercial Acetylene Railway Light & Signal Company, whose alibi is "E. T.," is not expected at the convention this year. Dick has been attending these conventions nigh unto nineteen years and but for a forced absence of one year on account of sickness, the string would be con-

H. C. Manchester (D. L. & W.) on the Job in His Office at Scranton

secutive. As a matter of fact, Dick just naturally grew into a place at these meetings because long before he was personally interested, his father used to bring him. For the past few years he has been active on the enrollment committee. His many friends will miss him this year.

E. W. Pratt, assistant superintendent of motive power and machinery, Chicago & Northwestern, and past president of the Western Railway Club, arrived Tuesday with Mrs. Pratt. Mr. Pratt is receiving congratulations as an A-1 star actor, he being the chief perpetrator and responsible for the recent "scandalous" performance at the annual meeting of the Western Railway Club. He is also receiving condolences from those who have not yet "bit." For full particulars see W. E. Symonds, the "villain" of the evening; Joe Taylor, or the members of the "Boosters' Committee" of the club.

Those of us who have to get here during the late afternoon of the Sunday before the convention opens, always find on the hotel register the names of certain members of the "old guard." We refer especially to Mr. and Mrs. D. C. Noble, of Pittsburgh; Mr. and Mrs. Scott Blewett, of St. Louis, and Mr. and Mrs. J. D. Hurley, of Chicago. And they usually stay to speed the last parting guest. Perhaps this leisurely way of doing things explains why none of them has aged a particle during the last ten years. Mr. Noble, however, is not feeling as fit as usual. Some of the facial nerves are disposed to be contrary, with the result that Mr. Noble suffers considerable pain at times.

One of the convention visitors for many years past who will be missed this year is A. R. Foley, of the Home Rubber Company. Mr. Foley was among the American citizens who were drowned when the Lusitania was sunk. He sailed for England, expecting to be gone only a few weeks, and had made his plans to attend the conventions. Mr. Foley had long been identified with the Stokes interests in Trenton, N. J., where he lived. He was born in England, came to this country when quite young, and early became connected with the Stokes Iron Works. When the Stokes interests organized the Home Rubber Company, he became its sales agent, and long traveled all over the United States. For the last three years he had been looking after the company's foreign interests. He was a jovial, big-hearted man, who had numerous friends among those who attend the conventions.

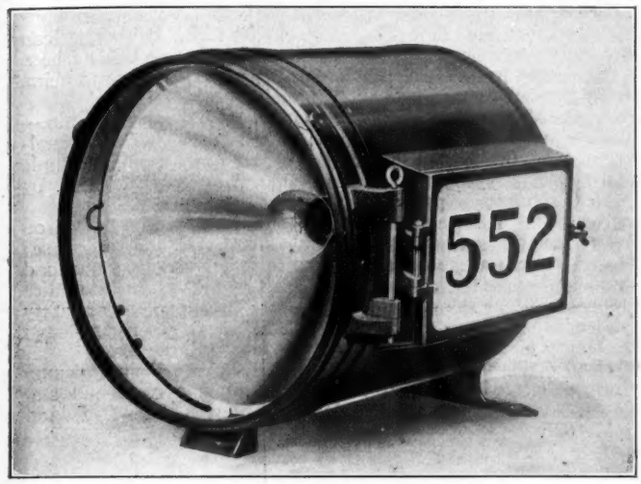
H. T. Bentley, superintendent motive power and machinery, Chicago & North Western, has lost his faith in Atlantic City. Having suffered with neuralgia due to Chicago's inclement month of May he came to the famous seaside resort extra early this year to get in fighting trim for the conventions. The god of storms, however, decided otherwise and Mr. Bentley has hardly seen the sun since his arrival. He and his daughter, Louise, were passengers on the ill-fated Lusitania on their return from England last summer, they arriving in New York July 31. Mr. Bentley reports that the North Western was one of the first to enter the pulverized fuel game. Orders have been placed with the Locomotive Pulverized Fuel Company for equipment for a 21 in. by 26 in. Atlantic type superheater engine. This engine will be equipped within a month and will operate on the Galena division out of Chicago. The purpose of the installation is to test out the possibilities of this fuel for eliminating smoke, noise and cinders, the city ordinances of Chicago being quite rigid in this respect.

For the first time in 25 years L. B. Sherman, vice-president of the *Railway Age Gazette,* is not among the visitors at the conventions this year. His absence is due to a very serious illness, from which he is slowly but steadily recovering. Mr. Sherman had already had several attacks of illness, from which he speedily recovered, when in the early part of last March, he was suddenly stricken at his home at Hubbard's Woods, a suburb of Chicago. He was hurried to St. Luke's Hospital and an operation performed. The surgeons found his condition so critical that all hope of his recovery was given up, but he pulled through the day following the operation and, although there were several days when his condition seemed to be almost hopeless, he showed a remarkable vitality, which carried him through. He was well enough last week to play a game of golf, the first since his illness. He is still somewhat weak, however, and will probably not be back at work until the late summer or early fall. Mr. Sherman is probably one of the best known men who attend the conventions. He was formerly secretary of the Railway Supply Manufacturers' Association, he has served on various committees of the association, he was a member of the Entertainment Committee for this year, and he was one of the prime movers in arranging for the first golf tournament in connection with the conventions, which was held last year. He has been one of the most efficient workers on *The Daily* ever since it has been under its present management, and he will be greatly missed this year by all his friends, and especially by his associates on *The Daily.* However, the regret caused by his absence is compensated for by realization of the fact that he soon will be well again.

INCANDESCENT HEADLIGHT EQUIPMENT

A recently-developed incandescent headlight equipment designed especially for use in switching service is being exhibited by the Pyle-National Electric Headlight Company, Chicago.

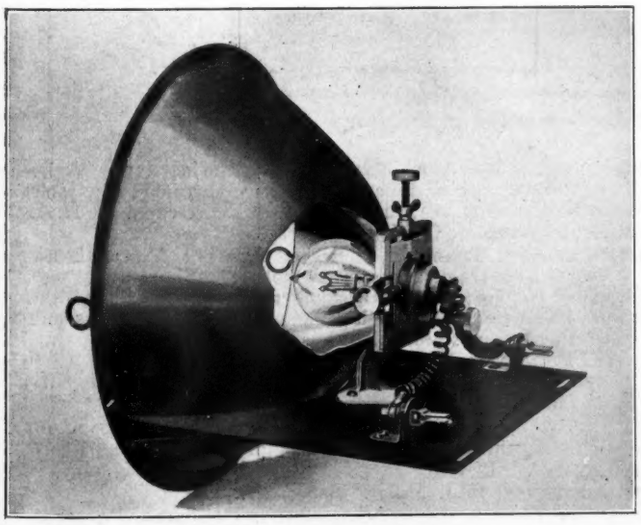
The new equipment is known as type "K," and the generating unit has a normal capacity of 300 watts; it weighs only 120 pounds, and occupies but little space, so that it can be mounted in any convenient place on the locomotive. The



Special 14-in. Incandescent Headlight Case

general outline is similar to the type "E" equipment, except that it is of smaller dimensions and has a number of new features.

The entire unit is self-contained, and shows a very high efficiency for a turbine of this size. The governor is well designed and controls the turbine speed within two percent, maintaining practically a constant voltage, which is absolutely necessary for incandescent illumination. The turbine operates on all steam pressures ranging from 60 lb. up and on



Method of Focusing the Lamp in the 14-in. Headlight Case

superheated as well as saturated steam without adjustment. The turbine is fed by a ⅜-in. pipe, and the exhaust outlet is fitted with a 1½-in. pipe. The rotar revolves in a partial vacuum, this tending to insure a high efficiency in the use of steam.

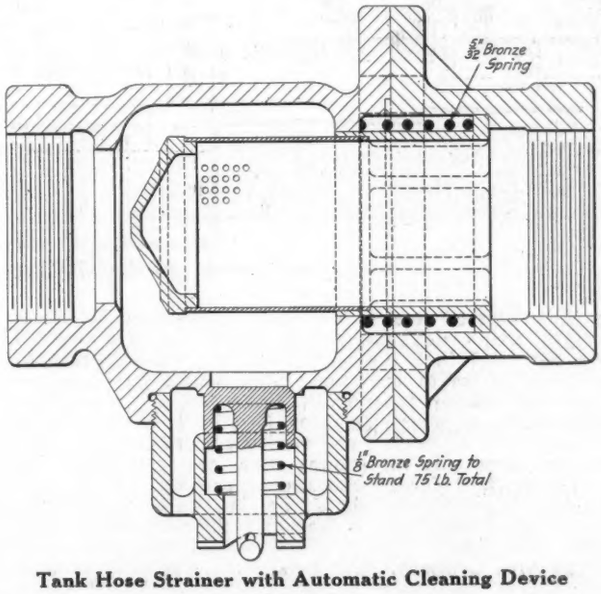
The generator is wound for 32 volts. With this voltage it is possible to obtain lamps of almost any desired candle power. This voltage has been recognized as standard, and has been proven to be the most desirable for locomotive illumination. The armature and commutator are mounted on the shaft, and are held in place by one screw. The brush holder attachment is fixed, and it is impossible for the brushes to get out of adjustment.

A special 14-in. headlight case has been designed in connection with this equipment, in which the lamp is supported horizontally from the back of the reflector. The goggle is hinged at both sides and may be readily removed. The reflector and slide are mounted on guides, and may be withdrawn from the front of the case, the electrical connections being made automatically by blade contacts when the reflector and slide are in place. The method of adjusting the lamp for focusing is clearly shown in one of the illustrations, the three adjustments being entirely independent of each other.

For switching service a 100-watt nitrogen lamp is supplied, with which it is said to be possible to distinguish objects clearly for a distance of 800 ft. For road service where a modified light is desired a 150-watt lamp of the same type is used. This is said to increase the range of distinct vision to 1200 ft.

COMBINED WATER STRAINER AND STRAINER CLEANER

The tank hose strainer shown herewith has recently been developed by the Barco Brass & Joint Company, Chicago, and is included in its exhibit on the pier. The strainer has the usual perforated cylinder through which the water passes from outside to inside. The strainer cylinder is secured at one end to a movable sleeve and at the other to a cone shaped valve which seats against the inner end of the water connection. Should the strainer become clogged it may be cleaned by merely turning steam pressure back through the injector suction pipe. This moves the strainer cylinder and



Tank Hose Strainer with Automatic Cleaning Device

sleeve towards the water connection, which it closes, thus preventing the flow of steam back through the hose. The pressure of the steam will blow the dirt from the strainer hose and will unseat the check at the bottom of the strainer body, allowing the dirt and water to be blown out to the ground. As soon as the steam pressure is turned off the springs will cause the return of the parts to their normal operating positions. In order to provide for the entrance of steam to the tank hose to prevent freezing in winter, the seat of the strainer may be scored or the end drilled to provide a small passage to the water compartment.

Railway Supply Manufacturers' Association Exhibit

Includes Names of Exhibitors, Brief Descriptions of the Exhibits, Names of Representatives, and Space Numbers

The exhibit this year is a little smaller than that of last year, but from the standpoint of the number of new devices and educational value probably averages higher. Its more important features are commented on in our editorial columns. Following is a list of the exhibitors, with data as to the devices exhibited, names of representatives, and location of exhibit:

Acme Supply Company, Chicago, Ill.—Acme simplex diaphragm; Acme reverse unifold diaphragm; Acme vestibule curtain outfit; Acme diaphragm opening attachments; Acme vestibule curtain revolving shield and sash locks; duplex weatherproof window; Regal revolving shade box; Kass safety step tread; Acme safety step box; Acme steel freight car ladder; Gosso beds for hospital bunk and caboose cars; Chanarch steel flooring; Acme steel passenger car doors; Faultless steel baggage car doors; Peerless steel baggage car doors; Acme anti-pinch hinge shield; Crown and Gem pinch handle curtain fixtures; Acme fool-proof curtain fixture; Acme friction roller curtain fixture; drawn steel mouldings. Represented by H. U. Morton, S. W. Midgley and R. C. Munro. Spaces 568-569.

Allegheny Steel Company, Pittsburgh, Pa.—Forsyth forged steel truck side frames; steel ties; continuous tie plates; rail braces; anti-creeping devices; spring plates; journal box lids; pressed steel specialties. Represented by W. D. Forsyth, Ralph McCarthy and L. C. Farquhar. Space 189.

Alston Saw and Steel Company, Folcroft, Pa.—Unbreakable hack saw blades in operation. Represented by Oscar W. Alston and William J. McArdle. Space 369.

American Abrasive Metals Company, New York, N. Y.—Feralun slip-proof treads for car steps, vestibule floors and door sills; Standard door sills for subway cars; new perforated slip-proof step tread for general use as passenger coach step; Feralun slip-proof floor plates; Feralun wheel truing brake shoes. Represented by William H. Sayre and Ellsworth Burger. Space 626.

American Arch Company, New York, N. Y.—Security sectional arch; Gaines combustion chamber. Represented by LeGrand Parish, John P. Neff, Harlow D. Savage, J. T. Anthony, George Wagstaff and R. J. Himmelright. Spaces 408-410.

American Balance Valve Company, Jersey Shore, Pa.—Valve motion models. Full size valves which have been in service and models of Jack Wilson high pressure slide and semi-plug piston valves, both adapted to old power as well as new. Represented by J. T. Wilson, Frank Trump and C. C. Young. Space 383.

American Brake Company, St. Louis, Mo.—Reception booth. Represented by R. E. Adreon and T. L. Burton. Spaces 19-29.

American Brake Shoe & Foundry Company, Mahwah, N. J.—Locomotive and car brake shoes illustrating modern practice. Represented by F. W. Sargent, W. S. McGowan and R. M. Brower. Space 416.

American Car and Foundry Company, New York, N. Y.—Cast iron wheels. Represented by William C. Dickerman, Scott H. Blewett, Clark D. Eaton, A. E. Ostrander, John McE. Ames and Benj. Wilson. Space 619.

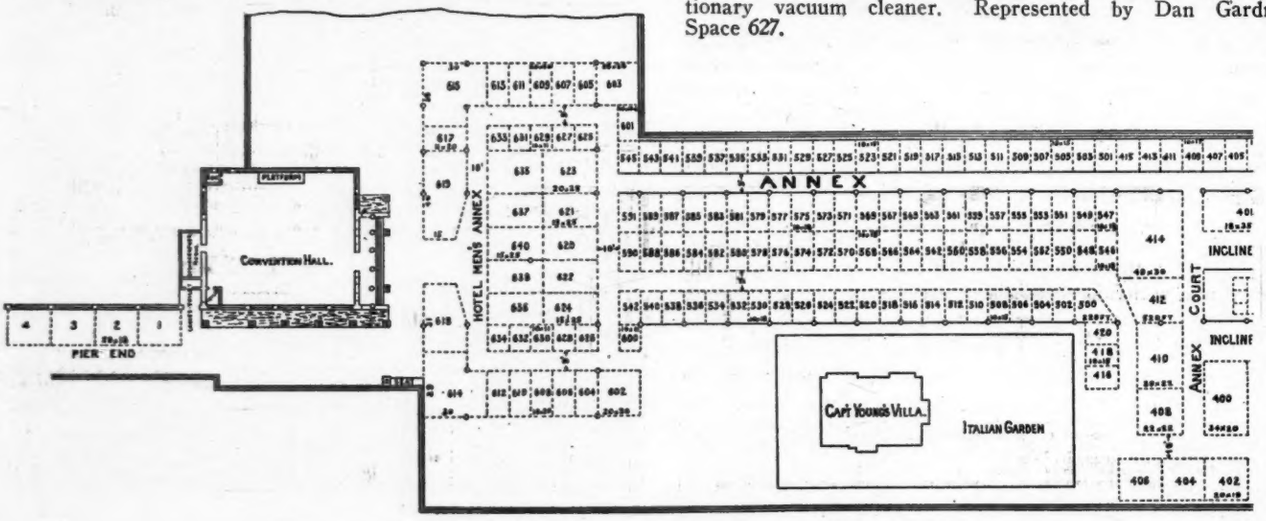
American Car & Ship Hardware Manufacturing Company, New Castle, Pa.—The Babcock safety water gage protector; bronze bushings. Represented by F. H. Babcock and P. J. Flaherty. Space 373.

American Flexible Bolt Company, Pittsburgh, Pa.—American staybolts; American staybolt bushings; U. S. self-locking bolt. Represented by C. A. Seley, R. W. Benson, H. T. Frauenheim, J. A. Frauenheim and L. W. Widmeier. Space 174.

American Malleable Castings Association, Cleveland, Ohio.—Walker wedge testing machine; photo-micrographs of malleable iron in its various stages of manufacture and sample castings and specimens of malleable iron. Represented by John C. Nulsen. Spaces 113-115.

American Mason Safety Tread Company, Lowell, Mass.—Mason safety treads, lead and carborundum filled, steel and brass base; Mason structural steel treads; Empire safety treads; Stanwood non-slipping, self-cleaning car steps and treads; Karbolith composition car flooring for steel cars; Mason non-slip safety ladder shoes; Mason non-slip "Dentil" nosing. Represented by Henry C. King and Ralph C. Davison. Space 542.

American Radiator Company, Chicago, Ill.—Arco Wand vacuum cleaners—electric and gasoline driven; one Arco Wand stationary vacuum cleaner. Represented by Dan Gardner. Space 627.



Arrangement of the Exhibit Spaces at the Ocean End of the Pier

American Saw Mill Machinery Company, Hackettstown, N. J.—Portable saw mill machinery; variety woodworker; saw tables for railroad shop use; circular saws. Represented by H. H. Hirschfeld and M. C. Hall. Spaces 162-164.

American Steel Foundries, Chicago, Ill.—The Vulcan truck; Andrews side frames; cast steel bolsters; Simplex bolsters; Simplex couples; American coupler pocket, Economy draft arms; Davis cast steel wheels; brake beams; springs; Susemihl roller side bearings; miscellaneous steel castings. Represented by R. P. Lamont, G. E. Scott, W. J. Lynch, J. V. Bell, G. F. Slaughter, W. Ross Gravener, D. T. Harris, T. H. Hopkirk, R. E. Janney and L. E. Jones. Space 193.

Anchor Packing Company, The, Philadelphia, Pa.—Packing for air pumps; throttles and general railroad purposes. Represented by W. R. Haggart, L. E. Adams, D. J. P. Murray, E. C. Adams and B. J. Miller. Space 371.

Armstrong Cork & Insulation Company, Pittsburgh, Pa.—Nonpareil corkboard insulation for cars and cold storage rooms; Nonpareil insulating brick; Nonpareil high pressure covering; cork covering for drinking water lines, brine and ammonia lines and cold pipes; Linotile for floors. Represented by C. H. Young and S. L. Barnes. Space 170.

Ashton Valve Company, The, Boston, Mass.—Master mechanic standard locomotive muffler and open pop safety valves; locomotive steam and air gages; wheel press recording gages; whistles; dead weight gage testers; piston Schwabs; locomotive boiler appliances. Represented by A. C. Ashton, J. F. Gettrust, H. O. Fettinger and J. W. Motherwell. Space 518.

Automatic Ventilator Company, New York, N. Y.—The Automatic car ventilator, as applied to monitor-deck and arched-roof steam and electric cars, shown by means of full sized and miniature demonstrating models. Represented by George H. Ford, Wm. J. Fleming, Jr., George H. Bryant and Frank A. Barbey. Space 313.

Baker & Company, Inc., H., New York, N. Y.—High speed and tool steel; metal specialties. Represented by A. W. Stephenson, A. S. Reeder and F. R. Decker. Space 364.

Barco Brass & Joint Company, Chicago, Ill.—Barco flexible joints; engine tender steam air and oil connections; metallic steam heat connections for cars; terminal car heating and air sets; water strainer; gage bracket; smoke box blower fitting; drip valves. Represented by F. N. Bard, C. L. Mellor and L. W. Millar. Space 609.

Beggs Signal Company, Julian, Terre Haute, Ind.—Automatic speed control. Represented by Stephen Smith. Space 183.

Besly, Charles H. & Company, Chicago, Ill.—One No. 15-30 inch C. Besly direct connected motor driven pattern makers' disc grinder. One No. 51-26 inch G Besly motor driven disc grinder with 18 inch helmet pressed steel ring wheel chuck. Represented by Edward P. Welles, Charles A. Knill and William H. Allen. Space 148-150.

Bettendorf Company, The, Bettendorf, Iowa.—Bettendorf all steel box car; 42 foot 40-ton steel box car underframe; section of improved refrigerator car underframe; single center sill for 40 foot 50-ton car; semi equalized 70-ton freight car truck; Bettendorf standard 40-ton freight truck. Represented by J. H. Bendixen, A. F. Macpherson, F. K. Shults, P. P. Beck, E. E. Silk, C. J. W. Clasen, W. G. Ransom and A. K. Reading. Space 200.

Bird-Archer Company, The, New York, N. Y.—Samples of polarized metallic boiler chemicals; anti-foaming chemicals; anti-leak chemicals. Tubes drawn from engines having used the Polarized treatment. P. B. Bird, C. A. Bird, J. A. McFarland, L. F. Wilson, H. V. Bootes, John Barnes and C. J. McGurn. Space 37.

Blackall, R. H., Pittsburgh, Pa.—Blackall drop handle ratchet; flat car type ratchet; improved Lindstrom brake lever; old style Lindstrom ratchet with back-off cap; pull-up ratchet arrangement with beveled gears and vertical shaft; tunnel brake ratchet arrangement using chain instead of shaft and separate winding drum for chain; Blackall trap door for vestibules. Robert H. Blackall and E. Emery. Space 588.

Buckeye Steel Castings Company, The, Columbus, Ohio.—Two 50-ton cast steel Buckeye type truck bolsters; one 50-ton cast steel pedestal type side frame; one 50-ton cast steel Buckeye Andrews type side frame; one Buckeye cast steel yoke for friction gear; one Buckeye cast steel yoke for tandem gear; cast steel journal boxes; Major coupler. Represented by S. P. Bush, C. B. Goodspeed, G. A. Macpherson, J. C. Whitridge, J. G. Bower, F. H. Bonnet, E. W. Campion, Geo. Groobey, G. T. Johnson and A. H. Thomas. Spaces 603-605.

Buffalo Brake Beam Company, New York, N. Y.—Buffalo freight brake beams for all classes and capacities of equipment. Truss beams with either malleable iron or forged steel struts to M. C. B. standards; also beams for E. & L. equipment and all classes and capacities of tenders and electrical equipment for standard broad and narrow gage. Buffalo passenger brake beams for all classes of service, including P. C. and L. N. equipment with automatically adjustable heads and safety locks. S. A. Crone, E. Strassburger, R. C. Fraser and O. W. Meissner. Spaces 550-551.

Burr Company, The, Champaign, Ill.—Dynamometer car Southern No. 2 track exhibit. Represented by E. M. Burr and L. R. Gulley. Space 632 and on track at Mississippi Avenue and Boardwalk.

Burroughs Adding Machine Company, Detroit, Mich.—Burroughs Master Car Builders machine. Represented by F. A. Willard. Space 534.

Byers & Company, A. M., Pittsburgh, Pa.—Wrought iron pipe. Represented by W. W. Williams, T. L. Lewis, R. A. Bruce and R. W. Kenney. Space 625.

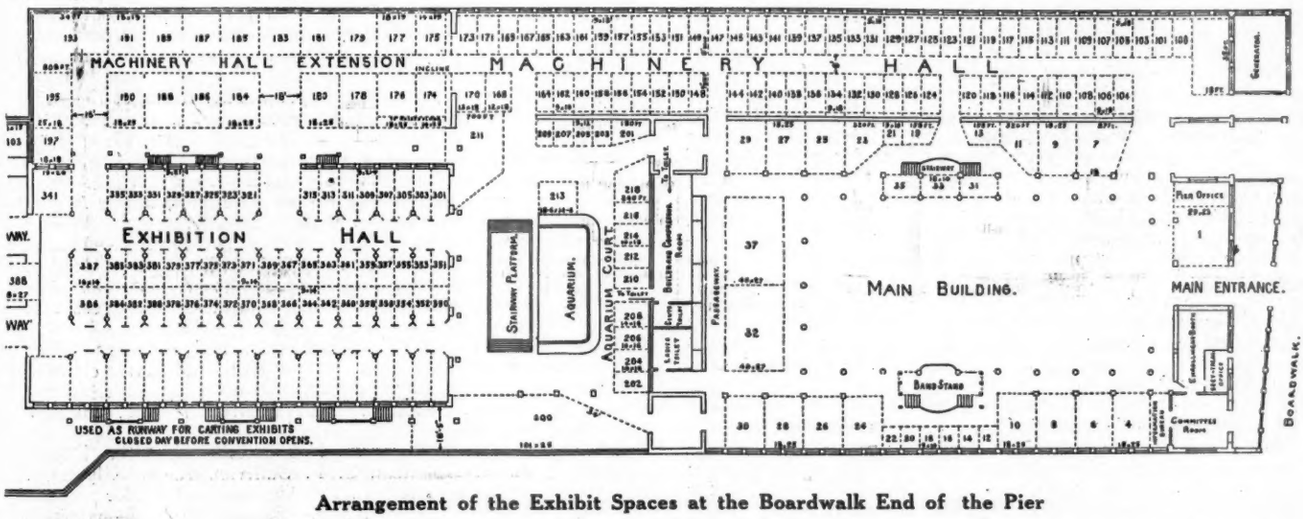
C. & C. Electric & Manufacturing Company, Garwood, N. J.—One 400 ampere C. & C. electric arc welding outfit complete with main control panel and three separate single welding panels, equipped with their patented system of automatic control throughout. This is an operating exhibit. Represented by Geo. W. Cravens, C. H. Florandin, John E. Chamberlin and Francis Caldwell. Space 2 pier end.

Cabot, Inc., Samuel, Boston, Mass.—Car insulation; fireproof car quilt; wood preservative; shingle stains; protective paints. Represented by John C. Donnelly. Space 381.

Cambria Steel Company, Philadelphia, Pa.—Slick draft gear. Represented by C. B. McElhany, W. S. Ottinger, H. G. Uphouse, L. B. Morris and R. V. Sage. Spaces 514-516.

Camel Company, Chicago, Ill.—Reception booth. Represented by J. F. Comee A. B. Wegecier J. M. Hopkins and P. M. Elliott. Space 536-538.

Carnegie Steel Company, Pittsburgh, Pa.—Schoen steel wheels, for steam railway service; Slick wheel products consisting of gear blanks, gear ring, gear rim blanks, turbine disc blanks, industrial wheels, street car wheels, rolled steel pipe flanges, submarine signal disc blanks, bevel roller blanks, automobile fly wheel blanks shaft couplings crane track wheels, and rolled steel locomotive pistons, together with exhibit of ingots and discs from which wheels are made. Standard steam railway ties, joints and fastenings. Alloy steels. Steel sheet piling. Represented by Wm. G. Clyde, I. W. Jenks, R. B. Woodworth, W. W. Scott, Jr., N. B. Trist, T. W. Williams, A. R. Willard, C. B. Friday and D. E .Sawyer. Space 414.



Arrangement of the Exhibit Spaces at the Boardwalk End of the Pier

Chambers Valve Company, New York, N. Y.—Chambers throttle valve. Represented by Frank H. Clark and J. M. Coffey. Space 418.

Chase & Company, L. C., Boston, Mass.—Chase mohair car plushes; Chase artificial leather for car seats. Represented by W. P. Underhill and H. T. Wight. Space 10.

Chicago Car Heating Company, Chicago, Ill.—Multiple regulation vapor system of car heating; Positive lock steam train line couplers; steam and hot water car heating specialties; emergency stoves. Represented by Egbert H. Gold, J. E. Buker, B. A. Keeler, R. P. Cooley, Eugene E. Smith, Elmer W. Rietz, Geo. T. Cooke, Harry F. Lowman, Frank F. Coggin, Edward A. Schreiber and A. D. Bruce. Spaces 212-214-216-218.

Chicago-Cleveland Car Roofing Company, Chicago, Ill.—Car roofs; steel carlines; composite box car ends; all steel ends. Represented by R. C. Dudley, T. N. Russell, J. L. Stark and A. S. Lewis. Space 506.

Chicago Varnish Company, Chicago, Ill.—Panels exemplifying their Ce-Ve process of painting railway coaches and engines. Represented by George S. iBgelow, Harry S. Whitehair and S. M. Dolan. Space 535.

Coe Manufacturing Company, W. H., Providence, R. I.—Coe's ribbon leaf and gilding wheels. Represented by E. J. Arlein and S. H. Swallow. Space 633.

Commonwealth Steel Company, St. Louis, Mo.—Catalogs, folders, drawings and a few models, all pertaining to the Commonwealth specialties. Represented by Clarence H. Howard, Harry M. Pflager, Geo. E. Howard, Boone V. H. Johnson, C. S. Shallenberger and W. P. Stout. Spaces 386-387.

Consolidated Car-Heating Company, Albany, N. Y.—Thermo-Vapor pressure system of heating; two-piece straight port steam couplers; steam traps; train line end valves; admission valves. Represented by C. C. Nuckols, Thomas Farmer, Jr., W. S. Hammond, Jr., Butler Keys and A. T. Harding. Space 179.

Consolidated Railway Electric Lighting & Equipment Company, New York, N. Y.—Type L-3 regulator with ampere hour meter control of the battery charging current and Type D-5 ball-bearing generator for car lighting. Represented by Thos. L. Mount, J. L. Watson and W. R. Hungerford. Space 588.

Crane Company, Chicago, Ill.—Crane locomotive pop safety valves; locomotive blow-off valves; locomotive cab valves; Crane railroad fittings, full line of globe, angle check and gate valves for railroad service, Crane-Erwood automatic stop and check valves; steam separators; steel valves for high pressure and superheated steam; automatic exhaust and relief valves; steam traps. Represented by F. D. Fenn and F. W. Venton. Spaces 552-554.

Crosby Steam Gage and Valve Company, Boston, Mass.—Locomotive safety valves; locomotive pressure gage; Johnston blow-off valve; recording gage for hydraulic presses; gage testing apparatus; indicators and their attachments. Represented by Edward C. Kenyon and H. B. Forbes. Space 630.

Curtain Supply Company, The, Chicago, Ill.—Car window and vestibule curtains; diaphragms and sash balances; ring fixtures; Rex rollers; Rex vestibule outfit and steel diaphragms. Represented by R. F. Hayes, G. E. Fox, W. H. Bentley and F. M. Egolf. Space 638.

Damascus Brake Beam Company, The, Cleveland, Ohio.—Forged steel fulcrums; adjustable brake heads; Brascott freight car ladder; Damascus water glass protectors. Represented by John F. Schurch and Albert Waycott. Space 555.

Dearborn Chemical Company, Chicago, Ill.—Water treating preparations scientifically prepared to suit conditions shown by analyses of the boiler water supplies, for prevention of scale, corrosion, pitting and foaming. Represented by Robert F. Carr, George R. Carr, J. D. Purcell, Grant W. Spear, Wm. H. Kinney, J. H. Cooper and A. W. Crouch. Spaces 6-8.

Delaware Railway Specialty Company, Wilmington, Del.—Parson's system of combustion. Represented by William H. Savery. Space 370.

Detroit Lubricator Company, Detroit, Mich.—Bullseye locomotive lubricators; flange lubricators; air cylinder lubricators; sight feed lubricators; force feed oilers; Detroit packless radiator valves. Represented by H. I. Lord, A. D. Homard and A. C. McChesney. Space 637.

Dixon, Joseph, Crucible Company, Jersey City, N. J.—Specimens of scale removed from locomotive boilers obtained through the use of Dixon's boiler graphite; photographs of various types of structures protected by Dixon's Silica-graphite paint; samples of Dixon's graphite lubricants especially adapted for railroad work; instruction cards. Represented by H. A. Chase, J. A. Tucker, H. A. Neally, W. H. Houston and L. H. Snyder. Space 24.

Draper Manufacturing Company, The, Port Huron, Mich.—Pneumatic locomotive turn-table motors; pneumatic flue welders; pneumatic superheater tube welders; tools for repairing superheater units; valve facing tools; ball check valves; hollow brass balls. Represented by Thos. Draper and Thos. Robinson. Space 528.

Duff Manufacturing Company, The, Pittsburgh, Pa.—Genuine Barrett track jacks; Duff high speed ball bearing screw jacks; Barrett car jacks; Duff improved geared ratchet jacks; Duff-Bethlehem forged steel hydraulic jacks; Duff journal box jacks. Represented by T. A. McGinley, E. A. Johnson, C. A. Methfessel, C. N. Thulin and G. E. Watts. Space 401.

DuPont Fabrikoid Company, Wilmington, Del.—Fabrikoid car window curtain material; Fabrikoid vestibule curtain material; Fabrikoid car seat upholstery material. Represented by C. Hallock Silkman, J. W. Stark and J. K. Rodgers. Spaces 548-549.

Durbin Automatic Train Pipe Connector Company, St. Louis, Mo.—Automatic train pipe connector; automatic safety car coupler; these will be operated by compressed air to show operation. Represented by V. S. Durbin and C. W. Durbin. Space 168.

Eagle Glass and Manufacturing Company, Wellsburg, W. Va.—Oilers, torches, supply cans, tallow pots, etc. Represented by J. L. Fusner and S. O. Paull. Space 600.

Economy Devices Corporation, New York, N. Y.—Ragonnet power reverse gear; Casey-Cavin power reverse gear; Universal valve chest; "Economy" exhaust nozzle; models of radial buffer; "Economy" engine truck; Woodard centering arrangement; bulletins, blueprints and drawings of Economy engine truck; four wheel Economy tender truck; multiple pipe clamps; Cole extended main driving box. Represented by H. F. Ball, J. L. Randolph and Hal R. Stafford. Spaces 408-410.

Edison Storage Battery Company, Orange, N. J.—Edison storage batteries for train lighting; industrial shop and baggage trucks; multiple unit control; locomotive headlights; railway signaling; inspection lamps. Represented by H. G. Thompson, F. V. McGinness, W. F. Bauer, C. A. Luckey and O. R. Hildebrant. Space 636.

Edwards Company, Inc., The O. M., Syracuse, N. Y.—Window fixtures; extension platform trap doors; sliding trap doors for high station platforms; all metal sash balances and shade rollers; weather stripping, and railroad padlocks. Represented by O. M. Edwards, E. W. Edwards, W. A. LeBrun, E. F. Chaffee, C. H. Rockwell, W. C. Bradbury and T. P. O'Brian. Spaces 527-529-531.

Elastic Car Waste Company, Philadelphia, Pa.—Packing for car journals. Represented by A. B. Birch, Jas. Gibson and A. Ahrens, 3d. Space 363.

Electric Controller & Manufacturing Company, The, Cleveland, Ohio.—Youngstown safety limit stop; crane switchboard with overload release; automatic machine tool controllers; push button controllers for wood working machinery; drum type controllers; cast grid resistance, literature of lifting magnets handling scrap iron, rails, etc. Represented by R. G. Widdows, E. C. Ryan and W. C. Jackson. Space 135.

Electric Storage Battery Company, The, Philadelphia, Pa.—E. S. B. constant voltage axle lighting system in operation; Hyray-Exide low voltage isolated plant for country home electric lighting, in operation; Chloride Accumulator and Ironclad-Exide cells for car lighting; Exide, Hycap-Exide, Thin-Exide and Ironclad-Exide cells for vehicle propulsion; Exide automobile starting and lighting batteries. Represented by J. Lester Woodbridge, J. MacBurney, F. G. Beetem and H. E. Hunt. Space 624.

Enterprise Railway Equipment Company, The, Chicago, Ill.—Car models showing all types of dump cars and door mechanism for same, including hoppers, gondolas, general service, divertible ballast and coal, convertible ballast or coal, plow gondola or ballast; also one convertible general service or ballast car on exhibit track at Mississippi Avenue. Represented by Argyle Campbell and A. E. Zimmer. Spaces 584-585.

Equipment Improvement Company, New York, N. Y.—Markel solid main rod end, lateral motion plate, shoes and wedges, removable driving box; Trojan packing; Wine roller side bearing. Represented by Frank H. Clark, C. W. Cross and E. C. Sawyer. Space 418.

Esterline Company, The, Indianapolis, Ind.—Golden Glow locomotive headlights; mine locomotive headlights; electric railway headlights; marine, dock and industrial searchlights; Esterline graphic meters. Represented by W. McKay White. Space 382.

Ewald Iron Company, Louisville, Ky.—Reception booth. Represented by R. B. Hickman, S. F. Sullivan, R. F. Kilpatrick, E. V. Shackleford and H. E. Pierce. Spaces 537-539.

Fastnut, Ltd., New York, N. Y.—Fastnut devises—washer, key and wrench. Represented by A. L. Story and J. D. McGrath. Space in passageway between ballroom and court.

Flannery Bolt Company, Pittsburgh, Pa.—Tate flexible staybolts, including standard water space stays, flush type, adjustable crown stays, section of boiler showing typical installations, tools for installation of Tate bolts, photographic views of various installations and display at the Panama Pacific Exposition. F. B. C. nut locks for freight and passenger cars. Represented by J. Rogers Flannery, B. E. D. Stafford, Charles Hyland, Geo. E. Howard, W. M. Wilson, Thos. J. Leahey, Barton H. Grundy and Jas. J. Flannery. Spaces 590-591.

Fort Pitt Malleable Iron Company, Pittsburgh, Pa.—Reception booth. Represented by Frank J. Lanahan, J. S. Lanahan and A .M. Fulton. Space 619.

Franklin Railway Supply Company, New York, N. Y.—Franklin fire door; Franklin water joint. Represented by J. S. Coffin, Sr., S. G. Allen, W. H. Coyle, R. G. Coburn, C. W. F. Coffin, J. S. Coffin, Jr. and H. M. Evans. Spaces 408-410.

Frost Railway Supply Company, The, Detroit, Mich.—Harvey friction spring gears; Detroit metal weather strip. Represented by Harry W. Frost, George A. Cooper and George L. Harvey. Space 560.

Galena-Signal Oil Company, Franklin, Pa.—Reception booth. Represented by S. A. Megeath, C. C. Steinbrenner, E. H. Baker, Barton H. Grundy, William Holmes, George L. Morton, William A. Trubee, William J. Walsh, J. E. Linahen, J. G. Arn, W. E. Brumble, J. W. Bunn, B. P. Corey, E. W. Grieves, E. G. Johnson, G. E. McVicar, P. H. Stack, W. O. Taylor, J. F. Walsh and J. A. Whalen. Space 32.

Garlock Packing Company, The, Palmyra, N. Y.—Air pump and

throttle packings; air brake and triple valve gaskets; special packings for accumulators and compressors; general line of shop packings. Represented by H. N. Winner, J. P. Landreth, W. G. Cook, Geo. T. Ramsey, T. P. Dunham, L. P. Duggan and F. W. Moore. Space 508.

General Brake Shoe & Supply Company, Chicago, Ill.—Brake shoes for use on all steam railway service. Represented by H. H. Hiland, C. E. Stecher, J. V. Valleau, B. J. Meyer, Ira C. Hubbell, John J. Stevens, Jr. and Wm. B. Neal. Space 4.

General Electric Company, Schenectady, N. Y.—Electric arc welding equipment; electric furnace; electric oil tempering bath; several types of motors; control; flow meters; incandescent lamps. Represented by W. J. Clark, P. A. Dyer, F. S. Hartman, W. O. Kellogg, C. A. Raymond, C. C. Peirce, B. F. Bilsland, J. A. Seede, C. Fair, J. Eaton, R. E. Woolley and L. W. Shugg. Spaces 157-173.

Gold Car Heating & Lighting Company, New York, N. Y.—M. C. B. standard steam hose couplers; vapor system; combination pressure and vapor system; automatic temperature control for steam heated trains; automatic temperature control for electrically heated trains; packless quick opening supply valve; steam traps; pressure regulators; ventilators. Edward E. Gold, E. B. Wilson, A. B. Strange, W. H. Stocks, J. M. Stayman, J. O. Brumbaugh, E. J. Ronan, A. E. Robbins, F. H. Smith and F. T. Kitchen. Spaces 301-303-305.

Goldschmidt Thermit Company, New York, N. Y.—All materials for welding locomotive frames and other broken locomotive parts; large sample welds on crank shafts; photographs of important welding operations; demonstrations of the process as applied to pipe welding and samples of metals and alloys produced free from carbon by the Thermit process. Represented by W. C. Cuntz, W. R. Hulbert, J. G. McCarty, William Aldrich, F. W. Cohen, H. S. Mann and H. D. Kelley. Spaces 137-139.

Goodwin Car Company, New York, N. Y.—Full size and working model of automatic dump and ballast car. Represented by Joseph Thayer Gilman, O. B. Gilman and Howard Van Scoy. Space 207—also track exhibit.

Goodyear Tire & Rubber Company, Akron, Ohio.—Samples of the Subers hose. Represented by L. H. Conger. Space 9.

Gould Coupler Company, New York, N. Y.—Gould cast steel jaw type side frame; high capacity freight friction draft gear 2½ in. travel, 250,000 capacity; fraction draft gear 3¼ in. travel, 300,000 capacity; fraction buffer for heavy steel passenger equipment; friction draft gear for passenger equipment, 2½ in. travel, 125,000 to 150,000 capacity; intermediate type of freight coupler; new type passenger coupler with all cast steel shank; pinless lid journal box; simplex system electric car lighting; storage batteries. Represented by F. P. Huntley, Geo. G. Milne, Clarence E. Rood and Geo. R. Berger. Spaces 608-610-612.

Greene, Tweed & Company, New York, N. Y.—Palmetto braided packing for piston rods; twist packing for globe valves, etc.; packing in sets for air pump service; packing in sets for throttle valve service; Manhattan packing for hydraulic pressures; Favorite reversible ratchet wrench for nut turning. Represented by H. S. Demarest, V. B. Nickerson and F. M. Thomson. Space 628.

Greenfield Tap and Die Corporation, Greenfield, Mass.—Motor driven bolt cutter; Acorn screw-cutting dies; reversing tapping chucks; automatic opening die head; reamers of all descriptions; new style or gun tap; friction tapping chucks; gages; hand taps and stay bolt taps. Represented by F. W. Strecker, F. C. Hoffman and W. A. Cook. Space 147.

Griffin Wheel Company, Chicago, Ill.—Car wheels on standards. Represented by C. K. Knickerbocker, H. N. Scott and A. A. Hale. Spaces 153-155.

Hale & Kilburn Company, Philadelphia, Pa.—Walkover car seats, latest styles; all-steel standard passenger coach seats; parlor and reclining car chairs; interurban car seats; metal doors for coaches and baggage cars; Steel integral window frame; Steel interior finish for coaches, parlor, dining and sleeping cars; Pressed steel mouldings, posts and parts for car construction. Represented by F. C. Edson, B. H. Forsyth, C. W. Laskay, A. F. Old, R. H. Pilson, F. F. Robb, H. R. Rochester and V. von Schlegell. Spaces 404-406.

Hammett, H. G., Troy, N. Y.—Trojan metallic packing; Trojan bell ringers; machine for expanding and beading copper pipe to coupling sleeves. Represented by H. G. Hammett and A. O. Van Dervort. Space 420.

Haring, Ellsworth, New York, N. Y.—E-H double X high speed steel, tool steels and specialties. Represented by Ellsworth Haring. Space 158.

Harrington, Son & Company, inc., Edwin, Philadelphia, Pa.—Chain hoists and travelers for overhead track. Represented by W. J. Somerset and Roger Sherron. Spaces 149-151.

Heywood Brothers & Wakefield Company, Wakefield, Mass.—Car seats for steel coaches. Represented by E. C. Lang, C. W. H. Frederick, Bertram Berry and Frank N. Grigg. Space 575.

Hunt Spiller Manufacturing Corporation, South Boston, Mass.—Cylinder bushings; cylinder packing; piston heads; valve bushings; valve packing; valve bull rings; eccentrics and straps; crosshead shoes; driving boxes; pedestal shoes and wedges; rod bushings. Represented by W. B. Leach, Frederic Parker, John G. Platt, A. B. Root, Jr., V. W. Ellet, J. M. Monroe, E. J. Fuller and H. McB. Parker. Spaces 562-563.

Hutchins Car Roofing Company, Detroit, Mich.—Half-tone cuts of all steel car roofs. Represented by F. M. Whyte, M. F. Ryan, D. W. Hawksworth and W. D. Thompson. Space 523.

Hulson Grate Company. Space 365.

Illinois Steel Company, Chicago, Ill.—Samples of heat treated track and crossing bolts with physical tests. Represented by D. E. Sawyer Space 414.

Imperial Car Cleaver Company, Newark, N. J.—Cleaners for cane seats and plush cushions. Represented by J. MacMarell Wilson, Frank Sherritt, J. Whitney Wilson and J. T. Hartnagel. Space 213.

Independent Pneumatic Tool Company, Chicago, Ill.—Reception booth. Represented by James Buchanan Brady, John D. Hurley, R. T. Scott, R. S. Cooper, H. F. Finney, Vernon Job and W. H. Rosevear. Space 574.

Ingersoll-Rand Company, New York, N. Y.—Little David pneumatic chipping and riveting hammers; jam riveters; holderons; pneumatic drills; Crown sand rammers and Imperial motor hoists. Represented by George A. Gallinger, E. H. Hinkens, M. O'Connor, Phil. Weiss, George S. Johnston, P. J. Christy, R. C. Cole, A. L. Wilhelm, C. R. Hewitt, W. A. Johnson, C. F. Overly and Wm. Wilhelm. Spaces 582-583.

International Oxygen Company, New York, N. Y.—I. O. C. system of oxy-hydrogen generators and accessories; I. O. C. stud valves; oxygen testing apparatus; high pressure oxygen cylinders. Represented by E. W. Erwin, P. J. Kroll and D. J. Tonkonogy. Space 341.

International Steam Pump Company, New York, N. Y.—One 12x7x10 Laidlaw Feather Valve air compressor, direct connected by close belt drive to 50 H. P. General Electric Motor; model of Glenora triple plunger deep well pump; Jeanesville horizontally split case turbine centrifugal pump. Represented by Paul B. Fenlon, C. Troutman, Thomas C. McBride and LeRoy Hilyard. Space front of Machinery Hall.

Jacobs-Shupert U. S. Firebox Company, Coatesville, Pa.—Models; photos; illustrations and circulars. Represented by C. Ducas, A. W. Whiteford, H. W. Jacobs, L. M. Henoch, Geo. R. Boyce, J. H. Smythe, G. T. Schnatz, F. H. Gordon, H. S. Coleman. Space 621.

Jenkins Bros., New York, N. Y.—Jenkins Bros. valves in brass, iron body and cast steel, for all pressures and purposes; round house valves; equalizing stop and check valves; mechanical rubber goods; sheet packing; gaskets; valve discs and rings; new oil-proof sheet packing, car heating discs. Represented by Frank Martin and B. J. Neely. Space 553.

Jessop, William & Sons, Inc., New York, N. Y.—Jessops steel tools. Represented by J. E. Sandmeyer, E. M. Britton and O. H. Reynolds. Space 504.

Johns-Manville Co., H. W., New York, N. Y.—Magnesia lagging; fire felt lagging; vitribestos; pipe coverings; air pump and throttle packing; sheet packing; gaskets; millboard; Transite and Ebony asbestos wood; asbestos shingles; friction and rubber tapes; electrical materials; fibre and sectional conduit; dry batteries; asbestos roofings; asbestos corrugated roofing; waterproofing and mastic; J-M expander rings; hair felt insulators; passenger and refrigerator car insulations; Vulcabeston; high temperature and insulating cements; smoke jacks; cork; armored hose; brake band lining; asbestos-metallic brake blocks. Represented by J. E. Meek, J. C. Younglove, G. A. Nicol, H. G. Newman, P. C. Jacobs, Geo. Christenson and F. J. Horne. Spaces 572-573.

Jones & Laughlin Steel Company, Pittsburgh, Pa.—Reception booth. Represented by Roland Gerry, Frank S. Slocum, George B. Mitchell and J. K. Barker. Space 409.

Kernchen Company, Chicago, Ill.—Kernchen siphonage ventilators. Represented by M. W. Hughes and P. R. Simmonds. Space 368.

Kerite Insulated Wire & Cable Company, The, New York, N. Y.—Kerite insulated wires and cables. Represented by R. D. Brixey, Azel Ames, P. W. Miller, J. W. Young and J. A. Renton. Space 510-512.

Keyoke Railway Equipment Company, Chicago, Ill.—Murray all cast steel friction draft gear and cast steel coupler yoke. Represented by George C. Murray and R. J. Cook. Space 321.

Keystone Equipment Company, Philadelphia, Pa.—Keystone driving box and assortment of Keystone tool holders. Represented by A. C. Buzby, H. A. Buzby and J. N. Mowery. Space 543.

Landis Machine Company, Waynesboro, Pa.—One 4 in. pipe threading and cutting off machine; chaser grinder; one 2 in. single spindle bolt cutter, belt driven; one 1½ in. double spindle bolt cutter, motor driven; one 2 in. stationary type pipe die

head; one 8 in. stationary type pipe die head; one 1¼ in. automatic screw cutting die head; one 1 in. solid adjustable die head. Represented by C. F. Meyer, F. C. Delcher, Dorsey Thompson, F. W. Heefner and J. W. Willis. Spaces 117-119.

Lehon Company, The, Chicago, Ill.—Roofing for railroad buildings; plastic car roofing; insulating paper; waterproof canvas for passenger coach, cab and caboose roofs; saturated burlap for waterproofing concrete construction work; paint for waterproofing, roofing and metal work. Represented by Tom Lehon. Space 18.

Liberty Manufacturing Company, Pittsburgh, Pa.—Turbine cleaners for arch tubes operated by steam, air and water. Represented by H. A. Pastre. Space 416.

Locomotive Stoker Company, Schenectady, N. Y.—One type "C" Street locomotive stoker. Represented by W. S. Bartholomew, Clement F. Street, W. G. Clark, J. J. Hannahan, O. B. Capps and J. J. Byrne. Spaces 403-405-407.

Loco-Light Company, Indianapolis, Ind.—One 32 volt incandescent headlight equipment. Represented by Robert H. Pyle. Space 614.

Locomotive Superheater Company, New York, N. Y.—Locomotive superheaters and accessories. Represented by Geo. L. Bourne, R. M. Ostermann, F. A. Schaff, G. E. Ryder, H. B. Oatley and W. A. Buckbee. Spaces 408-410.

Long, Charles R. Jr. Company, Louisville, Ky.—Railway paints of all kinds for locomotive and car departments. Represented by Charles R. Long, Jr., Harry Vissering, G. S. Turner, S. W. Russell and W. H. Heckman. Spaces 577-576.

Lubricating Metal Company, The, New York, N. Y.—Noheet bearing metal; Noheet metallic packing. Represented by C. B. Yardley, Jr., and Thatcher H. Soule. Space 367.

Lucas Machine Tool Company, Cleveland, Ohio.—Number 32 "Precision" horizontal boring, drilling and milling machine. Represented by W. L. Cheney, J. A. Leighton, Jr. and F. P. Sprague. Space 121.

Lukens Iron & Steel Company, Coatesville, Pa.—Reception booth with photographs of mill operation. Represented by Chas. Ducas, A. W. Whiteford, Henry W. Jacobs, L. M. Henoch, Geo. R. Boyce, J. H. Smythe, G. T. Schnatz and F. H. Gordon. Space 621.

Lundie, John, New York, N. Y.—The Lundie tie plate. Represented by John Lundie. Space 158.

Lunkenheimer Company, The, Ohio.—High grade steam engineering and motor accessory appliances; valves, bronze, iron body brass mounted, puddled semi-steel and crucible cast steel; whistles, water gages and gage cocks; ground key specialties; oil and grease cups; lubricators and oiling devices. Represented by Howard J. Evans and Andrew Lauterbach. Spaces 517-519.

M. C. B. Committee on couplers. Space, pier end.

MacRae's Blue Book Company, Chicago, Ill.—MacRae's blue book; the railway supply index catalogue. Represented by Albert MacRae, Alex. Smith and R. S. Lundy. Space 13.

Mahr Manufacturing Company, Minneapolis, Minn.—Mahr patent portable torches for car repair; boiler shop, foundry, brazing, paint burning and oil burning rivet forge work. Represented by J. A. Mahr, H. A. Warner and R. B. Ecker. Space 3, pier end.

Manning, Maxwell & Moore, Inc., New York, N. Y.—And subsidiary companies, comprising the Putnam Machine Company, Ashcroft Manufacturing Company, Consolidated Safety Valve Company, Hancock Inspirator Company and Hayden & Derby Manufacturing Company—Putnam latest car wheel boring mill; latest pattern 36 in. geared head lathe; No. 4 new pattern double axle lathe; journal turning lathe; National Machinery Company's latest type machines for forging and bolt cutting; a complete exhibit of brass goods consisting of Hancock inspirators, check valves, steam valves, hose strainers, boiler washers and other locomotive appliances; Metropolitan injectors; Consolidated safety valves; Ashcroft gages; Tabor indicators and instruments for measuring steam, water and gas. Represented by A. J. Babcock, James B. Brady, J. N. Derby, P. M. Brotherhood, F. P. Smith, Chas. L. Brown, Jos. H. Bush, R. A. Bole, F. J. Baumis, H. F. Brandes and E. R. Frost. Spaces 104 to 130.

Massachusetts Mohair Plush Company, Boston, Mass.—Car seat plushes and friezes and railway car seats. Represented by William W. Melcher. Space 22.

McConway & Torley Company, The, Pittsburgh, Pa.—Pitt passenger couplers; Pitt 3-stem passenger coupler equipment; Pitt freight coupler; Penn freight couplers of top and side operating designs. Represented by Stephen C. Mason, E. M. Grove, Wm. McConway, Jr., H. C. Buhoup, I. H. Milliken and W. J. Regan. Spaces 501-503-505.

McCord & Company, Chicago, Ill.—Steel and malleable journal boxes; force feed locomotive lubricators. Represented by A. C. McCord, D. W. McCord, J. A. Lamon, Morrell Dunn, W. J. Schlacks and H. E. Creer. Space 509-511.

McGraw Publishing Company, Inc., New York City.—Copies of Electrical Railway Journal; Electrical World, Engineering Record; Metallurgical & Chemical Engineering. Represented by Messrs. H. W. Blake, F. Kingsley, C. A. Babtiste, S. T. Henry, W. K. Beard, C. A. Henley and F. H. Behrens. Space 7.

McKinnon Chain Company, Buffalo, N. Y.—Electric welded chain. Represented by Geo. J. Armstrong. Space 366.

Midvale Steel Company, The, Philadelphia, Pa.—Reception booth. Represented by H. M. Deemer, Samuel Griffith, T. W. Illingworth, F. H. Philbrick, R. L. Williams and W. S. Edger. Space 640.

Miner, W. H., Chicago, Ill.—Friction draft gears; side bearings; centering devices and other railway specialties. Represented by W. H. Miner, A. L. Canavan, S. R. Fuller, Jr., J. R. Mitchell, W. E. Robertson, J. F. O'Connor, G. I. Haight and G. A. Johnson. Spaces 584-587.

Monroe Calculating Machine Company, New York, N. Y.—Machine which multiplies, divides, adds and subtracts without the use of complements, reciprocals or complicated manipulations of any kind. Represented by E. S. Maulsby and R. B. Hays. Space 558.

Mudge & Company, Chicago, Ill.—Mudge-Slater spark arrester model and Mudge-Peerless car ventilator. Represented by Burton W. Mudge and George W. Bender. Space 201.

Nathan Manufacturing Company, New York, N. Y.—Number 10 "XX" Monitor injector; number 11 Simplex injector type "R" flanged; number 10 Nathan injector, flanged; number 10 Simplex "HW" nonlifting injector flanged; 3-feed "BE" cup with cut out with booster; never leak gauge cock; coal sprinkler; balanced starting valve; 2-in. double boiler check type "T," 2-in. starting valve flanged; 2-in. intermediate steam valve; Locomotive pumps with 4 feeds; type "B" stationary pump 1 quart, 3-feed; type "A" pump 1 pint; type "A" pump ½ pint; balanced steam valve flanged bonnet; quadruple "BE" type 166 with cut out; quintuple feed "BE" 166 with cut out; single and double air cylinder attachment; never-leak gauge cock; 3-sided Delco water gauge guard; 4-sided Delco water gauge guard; Klinger water gauge guard number 4; Sectional model of type "B" pump; Woods pump 1 quart, 3-feed. Represented by E. S. Toothe, J. S. Seeley, J C. Currie and Robert Wood. Space 578, 579.

National Boiler Washing Company, Chicago, Ill.—Safety first fire doors; photographs of the National boiler washing system. Represented by W. White, H. A. Varney and E. B. White. Space 629.

National Brake Company, Inc., Buffalo, N. Y.—Peacock passenger, freight and baggage car brakes. Represented by Frank D. Miller and W. D. Brewster. Space 385.

National Car Wheel Company, Pittsburgh, Pa.—"Star special" cast iron car wheels. Represented by John Howard Yardley, J. Baueis Weisbrod, James D. Rhodes, H. E. McClumpha, R. H. Tate, C. A. Maher, George P. Rhodes and E. H. Chapin. Spaces 530-532.

National Graphite Lubricator Company, Scranton, Pa.—Graphite lubricators for locomotives and stationary engines. Represented by Edward L. Pollock, Lewis S. Watres, Thornton N. Motley, C. B. Flint and David J. Lewis. Space 307.

National Lead Co., New York, N. Y.—Red lead in paste form; steel cars (models) painted with paste red lead. Represented by F. M. Hartley, Jr., and Chas. Barr Field. Space 329.

National Lock Washer Company, The, Newark, N. J.—Models of car curtains; curtain and window fixtures; National lock washers; Hipower nut locks. Represented by F. B. Archibald, J. Howard Horn, R. F. Horsey and Daniel Hoyt. Space 541.

National Malleable Castings Company, The, Cleveland, Ohio.—Couplers; journal boxes; brake staff mechanism; malleable iron castings. Represented by T. W. Aishton, C. A. Bieder, J. J. Byers, W. E. Coffin, Chas. Gaspar, R. T. Hatch, J. H. Jaschka, O. W. Loomis, G. V. Martin, B. Nields, Jr., Jas. A. Slater, J. H. Slawson, S. L. Smith, E. O. Warner and L. S. Wright. Spaces 613-615.

National Railway Devices Company, Chicago, Ill.—Shoemaker fire door; National release rigging and single link release rigging. Represented by Jay G. Robinson and Percy P. Hinckley. Space 187.

National Tube Company, Pitsburgh, Pa.—Reception booth. Represented by L. F. Hamilton, G. N. Riley, P. J. Conrath, J. F. Goodwin, J. W. Kelly and W. S. Bitting. Spaces 548-549.

Newkirk, W. P., Portsmouth, Ohio.—Portable blue flag derail. Represented by W. P. Newkirk. Space 631.

New York Air Brake Company, The, New York, N. Y.—Reception booth. Represented by Scott R. Hayes, B. Pratt, O. E. Moore, C. E. Leach, Thomas O'Leary, Jr., H. F. Bickel, N. A. Campbell and William Owens. Spaces 374 to 377.

Niles Bement Pond Company, New York, N. Y.—Niles 44 inch vertical boring and turning mill; Bement 60 inch duplex horizontal borer, driller and miller. Represented by James K. Cullen, Edward L. Leeds, Geo. F. Mills, Chas. L. Lyle and D. J. Normoyle. Spaces 134-136-138-140-142-144.

Norton, A. O., Inc., Boston, Mass.—Self lowering high speed jacks. Represented by A. O. Norton, Harry A. Norton, J. O. St. Pierre, Henry J. Wilson, F. L. Gormley, R. L. Skidmore and Chas. H. Smith, Jr. Space 559.

Nuttall Company, R. D., Pittsburgh, Pa.—Flexible gears and pantograph trolley as installed on Pennsylvania Railroad motor cars Philadelphia to Paoli electrification; locomotive rings, gears and third rail pantograph trolleys; ten inch trolley wheel and harp for high speed interurban and locomotive service; display of heat treated steels as applied to railway gears and pinions. Represented by Milton Rupert, W. H. Phillips and L. H. Keim. Spaces 143-145.

Nutter & Barnes Company, Hinsdale, N. H.—Automatic cold sawing machines; abrasive wheel metal cutting machines; automatic metal saw sharpeners, universal tool grinders; hydraulic plain cylindrical grinders; saw-gear and milling cutter sharpeners; motor driven. Represented by W. S. Howe and A. E. Champagne. Space 156.

O. and C. Company, The, New York, N. Y.—Emergency knuckles; skid shoes; car and engine replacers; diaphragms; E. M. Smith, Edmund Quincy and F. F. Kister. Space 187. Ross-Schoefield system of boiler circulation; snow flangers. Represented by C. F. Quincy, C. F. Pierce, J. V. Wescott,

Okonite Company, The, New York, N. Y.—Reception booth. Represented by F. J. White and W. T. Kyle. Space 500.

O'Malley-Beare Valve Company, Chicago, Ill.—Multiplate; full line of round house service valves, globe, angle and checks; locomotive special valves; duplex blow-out valves. Represented by Edward O'Malley and Thos. O'Malley. Space 210.

Pantasote Company, The, New York, N. Y.—Agasote headlining and panelling; Pantasote curtain material and upholstery leather. Represented by Wm. Anderson, Wm. A. Lake and John M. High. Space 400.

Parkesburg Iron Company, The, Parkesburg, Pa.—Charcoal iron boiler tubes; safe ends; arch tubes and locomotive superheater tubes; and Lohmannized boiler tubes. Represented by H. A. Beale, Jr., George Thomas, 3rd, W. H. S. Bateman, J. A. Kinkead, J. R. Wetherald and G. W. Denyven. Space 388.

Paxton-Mitchell Company, The, Omaha, Neb.—Piston rod, valve stem, air pump and cylinder packing. Represented by James L. Paxton and Wm. Leighton. Space 209.

Philadelphia & Reading Railway.—Reading or 4-4-4 type of passenger locomotive. Space on exhibit track at Mississippi Avenue.

Pilliod Company, The, New York, N. Y.—Engine model with Baker valve gear. Represented by R. H. Weatherly, K. J. Eklund, F. S. Wilcoxen, C. M. Jennelle, R. G. Graham and F. E. Pilliod. Spaces 556-557.

Pocket List of Railroad Officials, The, New York, N. Y.—The pocket list of railroad officials. Represented by J. Alexander Brown, Charles L. Dinsmore and Harold A. Brown. Space 7.

Power Specialty Company, New York, N. Y.—Full size model of Foster locomotive superheater. Represented by L. B. Nutting, G. B. Ferrier, Jr. and Frank Page. Space 635.

Pressed Steel Car Company, New York, N. Y.—Photographs of products. Represented by O. C. Gayley, J. F. MacEnulty, J. H. Regan, C. A. Lindstrom, C. E. Postlethwaite, J. H. Mitchell, L. O. Cameron, J. C. Anderson, J. S. Turner, W. H. Wilkinson, M. S. Simpson, H. S. Hammond, G. W. Ristine and F. L. Johnson. Spaces 545-601.

Pyle-National Electric Headlight Company, Chicago, Ill.—Type "E" arc headlight equipment, with special headlight case; type "K" incandescent headlight equipment, with special headlight case; Young locomotive valve gear; Young locomotive reversing gear; Young locomotive piston valve; Van Dorn sectional and one piece steel car ends. Represented by J. Will Johnson, J. E. Kilker, C. E. Miller, Wm. Miller, C. P. McGinnis, R. C. Vilas and O. W. Young. Spaces 602-604-606 and 90.

Pyrene Manufacturing Company, New York, N. Y.—Pyrene fire extinguisher for railway coaches, freight platforms, signal towers, buildings, offices, oil houses. Represented by E. L. Kent, W. H. McKinnon and O. E. Meske. Space 203-205.

Railway Age Gazette, New York, N. Y.—Publications Railway Age Gazette; Mechanical Edition Railway Age Gazette; Signal Engineer; other publications devoted to the transportation industry. Represented by E. A. Simmons, Samuel O. Dunn, Roy V. Wright, R. E. Thayer, A. C. Loudon, C. B. Peck, Geo. Mitchell, C. W. Foss, F. W. Kraeger, A. R. Gegen, M. E. Christy, C. R. Mills, Henry Lee, F. H. Thompson, A. F. Ashbacker, W. M. Ford, H. H. Marsh, W. D. Horton and F. S. Dinsmore. Space 1.

Railway Devices Company, St. Louis, Mo.—"Western" angle cock holder; Perfect drop brake handle; "Iron Horse" or pedestal; "Spiral" pipe clamps; "Interlox" brake mast ratchet and pawl. Represented by Louis A. Hoerr and Sterling Campbell. Space 618.

Railway Master Mechanic, Chicago, Ill.—The publication itself. Represented by Charles S. Myers and Laurence A. Horswell. Space 20.

Railway Materials Company, The, New York, N. Y.—Brake shoes. Represented by T. B. Cram, George Hoeffle, E. C. Folsom, I. B. Lesh and G. F. Allen. Space 561.

Railway Review, Chicago, Ill.—Railway Review current issues and files of previous issues. Represented by Willard A. Smith, Arthur E. Hooven, J. E. Gougeon, Jno. M. Lammedee and Clyde F. Burns Spaces 12-14.

Railway Utility Company, Chicago, Ill.—Various types of honeycomb ventilators for Monitor and arch roof cars; thermostat control for steam and electric heat. Represented by W. J. Pine and G. E. Pratt. Space 380.

Ralston Steel Car Company, The, Columbus, Ohio.—Model "Ohio flush side door." Represented by J. S. Ralston, A. Becker, A. D. McAdam, F. E. Symons, J. R. Forney, W. T. Sheldon, R. R. Weaver and C. S. Rea. Space 607.

Readng Specialties Company, Reading, Pa.—Rail benders; rail joints; guard rail clamps; rerailers. Represented by J. Turner Moore, M. G. Moore, B. J. Buell and R. G. Ross. Space 315.

Remy Electric Company, Anderson, Ind.—American 6 and 32 volt incandescent headlight. Represented by Thomas B. Arnold. Space 614.

Robinson Company, The, Boston, Mass.—Robinson exhaust nozzle. Represented by Frederic Parker and Frank Robinson. Spaces 564-565.

Rochester Germicide Company, Rochester, N. Y.—Automatic disinfecting appliances; general line of disinfectants; bubbling drinking fountains; liquid soap; soap dispensers. Represented by C. J. Pearson and D. N. Calkins. Space 502.

Rome Merchant Iron Mill, Rome, N. Y.—Rome "Superior" stay bolt iron and "Perfection" engine bolt iron. Represented Weston Jenkins. Space 614.

Ryerson & Son, Joseph T., Chicago, Ill.—Ulster special staybolt iron; Ulster engine bolt iron; Nikrome locomotive forgings; photographs and drawings of special railroad shop machinery. Represented by Geo. M. Basford, H. A. Gray, J. B. Warren and E. W. Kavanagh. Space 176.

Safety Car Heating & Lighting Company, New York, N. Y.—Safety "Under-frame" car lighting equipment; Pintsch mantle car lighting equipment; gas and electric car lighting fixtures; safety electric fan; Oxy-Pintsch metal cutting and welding equipment. Represented by R. M. Dixon, J. A. Dixon, A. C. Moore, G. H. Chadwell, W. L. Garland, J. S. Henry, R. C. Shaal and G. E. Hulse. Space stairway platform.

Safety First Manufacturing Company, Chicago, Ills.—Safety first combustion chamber; caboose stove; angle cock bracket; armored hose; safety parcel rack for passenger coaches; perfection door guide and seal; Fitch check holders for passenger cars; asbestos and magnesia products. Represented by Fay E. Posson and L. L. Cohen. Space 175.

Sargent Company, Chicago, Ill.—Sargent safety water guage; Wirth automatic safety water glass cocks; Sargent blow-off valve; safety valves; Loeidge quick acting blower valve; Lenz safety lathe dog. Represented by Frank G. Dunbar and George H. Sargent. Space 738.

Sellers, William & Company, Inc., Philadelphia, Pa.—Reception booth. Represented by Strickland L. Kneass, John D. McClintock, Charles T. Wilson, E. L. Holljes and L. H. Burns. Space 623.

Simplex Air Brake and Manufacturing Company. Space 614.

Southern Locomotive Valve Gear Company, Knoxville, Tenn.—Miniature locomotive and model equipped with the Southern valve gear. Represented by E. L. Chollman. Spaces 522-524.

Standard Asphalt & Rubber Company, Chicago, Ill.—Permanent waterproofing; mineral rubber pipe coating; mineral rubber floor. Represented by Chas. V. Eades. Space 634.

Standard Car Truck Company, Chicago, Ill.—One 50-ton truck and one 70-ton truck full size; one 70-ton car on exhibit tracks; 12 various models; 6 various parts. Represented by J. C. Barber, J. T. Milner, F. L. Barber, L. W. Barber and E. W. Webb. Spaces 178-180.

Standard Coupler Company, New York, N. Y.—Reception booth. Represented by Geo. A. Post, E. H. Walker, Geo. A. Post, Jr., R. D. Gallagher, Jr., and A. P. Dennis. Space 617.

Standard Heat & Ventilation Company, Inc., New York, N. Y.—Car heating apparatus of all kinds; Passenger car ventilators; steam hose couplers; end train line valves; automatic traps and regulators; Standard Econotherm. Represented by Samuel Higgins, C. F. McCuen, C. H. McCormick and L. B. Rhodes. Space stairway platform.

Standard Stoker Company, Inc., New York, N. Y.—Mechanical stokers for locomotives. Represented by Frank L. Connable, James A. Carey, Eugene duPont, David T. Williams, E. A. Averill, F. H. Cunningham and Walter Coopey. Space 211.

Stark Car Coupler Corporation, Washington, D. C.—The Stark car coupler and two miniature cars equipped with the coupler. Represented by C. H. Kadie and L. A. Shepard. Space 174.

Stockbridge Machine Company, Worcester, Mass.—One machine tool—20 inch Stockbridge patented two-piece-crank motion

motor driven shaper. Represented by A. W. Beaman and Radford Stockbridge. Space 132.

Summers Steel Car Company, Pittsburgh, Pa.—One freight car truck equipped with Summers arch bar side frame. Represented by E. W. Summers and J. M. Summers. Space 111.

Superior Oxygen Company, Pittsburgh, Pa.—Oxygen and oxy-acetylene welding and cutting apparatus. Represented by J. A. Warfel. Space 515.

Symington Company, The T. H., Rochester, N. Y.—Reception booth. Represented by C. J. Symington, A. H. Weston, C. R. Naylor, D. F. Mallory, R. H. Gwaltney, W. W. Rosser, T. C. deRosset and I. O. Wright. Spaces 570-571.

Transportation Utilities Company, New York, N. Y.—National steel trap doors; Flexolith composition flooring; metallic steel sheathing; Imperial car window screens; National standard roofing; Resisto insulation; Reliance and Perfection sash balances; deck sash ratchets. Represented by D. W. Pye, W. L. Conwell, Garrett Burgert, H. B. Chamberlain, F. N. Grigg and W. S. Humes. Spaces 566-567.

Union Draft Gear Company, Chicago, Ill.—Draft gear and side bearings. Represented by Jas. R. Cardwell, L. T. Canfield, J. W. Hathaway, W. G. Krauser, Jas. E. Tarelton and H. Barnard. Space 409.

Union Railway Equipment Company, Chicago, Ill.—Pries metal roofs; Union drop brake shaft; Pries refrigerator radiators; Pries brine tank valves. Represented by W. B. Hall. Space 507.

Union Spring & Manufacturing Company, Pittsburgh, Pa.—Kensington pressed steel journal boxes; coil and elliptic springs for any service on steam and electric roads; machinery and agricultural implement springs; pressed steel spring plates and journal box lids; pressed steel shapes of various designs. Represented by L. G. Woods, C. S. Foller, A. C. Woods and H. F. Ayres. Space 620.

United Engineering & Foundry Company, Pittsburgh, Pa.—Photographs of forging press installations in railroad and other forge shops. Represented by Arnold P. Bark. Space 540.

United States Graphite Company, The, Saginaw, Mich.—Graphite products for railroad use; Mexican boiler graphite; number 205 lubricating graphite. Represented by J. W. Eviston, W. W. Lampkin, C. M. Williamson and A. B. Turnbull. Space 526.

U. S. Light & Heating Company, Niagara Falls, N. Y.—Complete U-S-L electric lighting equipment for railroad cars, in operation; U-S-L axle generators in various sizes, each a unit in an equipment; U-S-L storage batteries in types for car lighting; U-S-L storage batteries in types for operation of automatic signals. Represented by L. R. Pomeroy, H. A. Mathews, J. A. White, R. C. Haley, W. L. Bliss, C. C. Bradford, E. F. Oates, Wm. G. Davis, J. Allan Smith, A. H. Ackermann, W. A. Turbayne and L. S. Cunny. Spaces 333-335.

U. S. Metal & Manufacturing Company, New York, N. Y.—Cayuta ball and cone bearing screw jacks, high speed and standard; ratchet jacks, pressed steel seamless gear case; Linofelt and Fibrofelt. Represented by B. A. Hegeman, Jr., Chas. C. Castle, F. C. Dunham, H. A. Hegeman, H. K. Porter, H. S. Norris, E. D. Hillman, H. A. Stone and W. T. Goodnow. Space 622.

U. S. Metallic Packing Company, The, Philadelphia, Pa.—King metallic packings; Leach sanders; Gollmar bell ringers. Represented by Morris B. Brewster, H. M. Wey, John S. Mace and R. R. Wells. Space 525.

Universal Car Seal & Appliance Company, Albany, N. Y.—Universal line of car door fasteners for wood or steel construction and standard for any car seals; "Universal" car seals. Standard for any car door fasteners. Represented by Wm. C. Martineau and Allston Headley. Space 520.

Universal Draft Gear Attachment Company, Chicago, Ill.—Full sized model cast steel draft arms, with twin spring key connected draft gear; keyed yokes for friction and tandem draft gears; lock yokes for friction draft gears; one-piece cast steel riveted yokes for friction and spring draft gears; miscellaneous malleable iron and cast steel draft plates; lugs, etc. Represented by C. J. Nash and C. C. Kinsman. Space 521.

Valentine & Company, New York, N. Y.—Valentine's Valspar railway finishing varnish; panels showing our various systems of painting wood and steel railway equipment; various tests showing action of weather, moisture, car soaps and cleaners on various grades of varnish, panels showing our signal enamels. Represented by Langdon B. Valentine, Irving H. Munford and Harry L. Bell. Spaces 580-581.

Vissering & Company, Harry, Chicago, Ill.—Viloco locomotive sanders; duplex engineers' valve; bell ringer; bell ringer throttle valve; one piece brake step; Crescent metallic packing. Represented by Harry Vissering, Chas. R. Long, Jr., Guilford S. Turner and Wm. H. Heckman. Spaces 576-577.

Walker Company, Inc., Sheridan A., New York, N. Y.—New improved all-steel railroad car-seats. Represented by A. H. Flint and S. A. Walker. Space 589.

Warner & Swasey Company, The, Cleveland, O.—One number 2A universal hollow hexagon turret lathe, operating on bar work; one number 3A universal hollow hexagon turret lathe operating on chucking work. Represented by A. C. Cook, L. K. Berry and H. E. Witham. Space 123-125.

Waugh Draft Gear Company, Chicago, Ill.—Draft gear. Represented by C. H. Osborn. Space 513.

Wayne Oil Tank & Pump Company, Fort Wayne, Ind.—Hand and power driven self-measuring pumps and storage tanks. Represented by W. M. Griffin, Edward H. Barnes and B. F. Geyer. Space 11.

West Disinfecting Company, New York, N. Y.—Liquid soap dispensers and liquid soap; Formosal fumigators; automatic drip machines; Protectus machines; sanitor closet; West portable steam sterilizer; fumigating lamps; Coro-Noleum. Represented by Geo. L. Lord, H. E. Daniels and Dr. Hyde R. Fussell. Space 26.

Western Railway Equipment Company, St. Louis, Mo.—Western brake jaws; Acme pipe clamps; Security dust guards; Western steel carline; Linstrom syphon; Acme brake adjuster. Represented by Louis A. Hoerr and Sterling Campbell. Space 618.

Western Steel Car & Foundry Company, New York, N. Y.—Photographs of products. Represented by O. C. Gayley, J. F. MacEnulty, J. H. Regan, C. A. Lindstrom, C. E. Postlethwaite, J. H. Mitchell, L. O. Cameron, J. C. Anderson, J. S. Turner, W. H. Wilkinson, M. S. Simpson, H. S. Hammond, G. W. Ristine and F. L. Johnson. Spaces 545-601.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Reception booth. Represented by A. L. Humphrey, Walter V. Turner, E. A. Craig, J. R. Ellicott, C. P. Cass, C. J. Olmstead and F. V. Green. Spaces 19-29.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Reception booth. Lighted with 200-watt type C Mazda Lamps. Represented by J. C. McQuiston, W. H. Patterson, J. H. Bryan, H. W. Beaumont, R. F. Moon, R. J. Ross, H. C. Mode and L. W. Popp. Spaces 19-29.

Westinghouse Friction Draft Gear Company, Pittsburgh, Pa.—Reception booth. Represented by Robert Burgess, H. E. Chilcoat and S. J. Kidder. Spaces 19-29.

Westinghouse Lamp Company, East Pittsburgh, Pa.—Reception booth. Represented by Elliott Reid. Spaces 19-29.

Westinghouse Machine Company, East Pittsburgh, Pa.—Reception booth. Represented by E. H. Sniffin, M. C. McNeil and R. E. Miller. Spaces 19-29.

Westinghouse Pacific Coast Brake Company, Emeryville, Cal.—Reception booth. Represented by S. G. Down and C. C. Farmer. Spaces 19-29.

Westinghouse Traction Brake Company, Pittsburgh, Pa.—Reception booth. Represented by F. M. Nellis. Spaces 19-29.

Wheel Truing Brake Shoe Company, Detroit, Mich.—Samples of abrasive brake shoes for truing up car wheels and locomotive driver wheels. Represented by J. M. Griffin. Space 533.

White American Locomotive Sander Company, Roanoke, Va.—Combined pneumatic track sander and pipe cleaner. Represented by W. H. White, John E. Graham and R. J. Donahoe. Space 379.

Willard Storage Battery Company, Cleveland, Ohio.—No-wash train lighting storage battery and parts. Represented by W. E. Ballantine, R. N. Newolt, F. S. Gassaway, Louis Sears and E. L. Myers. Space 611.

Wilson Remover Company, Newark, N. J.—Wilson removers and appliances. Represented by J. MacMaull Wilson, J. Whitney Wilson, Frank Sherritt and J. T Hartnagel. Space 213.

Windsor Machine Company, Windsor, Vt.—Reception booth. Represented by F. L. Cone and Thomas F. Du Puy. Space 101, 102.

Wray Publishing Company, Chicago, Ill.—Periodical; Railway Electrical Engineer; monthly. Represented by Edward Wray and C D. Sperry. Space 16.

Wright Safety Air Brake Company, Greensboro, N. C.—Automatic train stop; air brake. Represented by J. E. Latham, J. B. Wright, F. O. Lawson, F. H. White and J. C. Watkins. Space 384.

Yale & Towne Manufacturing Company, The, New York, N. Y.—Yale triplex hoists, trolleys, electric hoists, battleship projectile hoists, Yale coach door closers. Represented by C. W. Beaver and W. A. Hall. Spaces 152-154.

COAL IN SPAIN.—An article in a Spanish journal states that in 1913 the coal basins in Spain were found to cover an area of about 494,000 acres, containing 3500 collieries, of which 762 only were working, embracing an area of 98,000 acres. The probable quantity of coal existing in the province of Asturias alone has been estimated at 5000 million tons.

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WE GUARANTEE that of this issue 10,011 copies were printed; that of those 10,011 copies 8,572 were mailed to regular paid subscribers to the Railway Age Gazette and the Railway Age Gazette, Mechanical Edition; 150 were provided for counter and news companies' sales; 189 were mailed to advertisers; 100 were provided for bound volumes, and 1,000 for distribution at Atlantic City.

The RAILWAY AGE GAZETTE and all other Simmons-Boardman publications are members of the Audit Bureau of Circulations.

Stokers and Increased Capacity

The discussion of the report of the Committee on Mechanical Stokers brought out very definitely that the stoker manufacturers, or at least some of them, do not claim a saving in fuel by the use of stokers. They do, however, claim a marked increase in locomotive capacity; that is, a locomotive can haul a greater tonnage at a higher speed when stoker-fired than when hand-fired, and all the testimony seems to bear this out conclusively. Statements made during this discussion to the effect that stokers have been known to fire as high as 15,000 lb. of coal per hour, also show that there need be no limitation placed on locomotives as far as fuel consumption is concerned, as the stoker can be made to supply any amount of fuel which can be consumed on the grate. The particular field, therefore, of the mechanical stoker is not direct saving in fuel but increased tonnage.

Make Better Use of Associate Members

President Gaines made an excellent suggestion in his address when he directed attention to the fact that many of the associate and honorary members of the association, who are in position to help considerably in the investigations of the various committees and in preparing the reports, are being overlooked. If the work of the association is reviewed it will be found that certain associate members, because of their special knowledge or because of having time to devote to the work, have helped to prepare some of the most important and valuable of its reports and papers. Of course there may be subjects which, because of their nature, must be handled entirely by men in responsible positions in actual service, but these are comparatively few in number and there is hardly a committee in either the M. M. or M. C. B. Association which could not use the services of some of these members to excellent advantage. The matter can be easily adjusted if the executive committee will keep it in mind in outlining the work of the coming year.

Restrictions on Autogenous Welding

In explaining the attitude of the Interstate Commerce Commission on the subject of autogenous welding in boiler work, Frank McManamy, chief boiler inspector, said that some of its over-enthusiastic friends are using it for purposes which will result only in retarding its development and restricting its legitimate field. Among the uses mentioned as not meeting with approval was that of repairs to boiler sheets that are wholly in tension, without any staying to assist in their support or in the absorption of stresses. We do not know to what extent this practice is being followed, but we have seen autogenous welding methods employed in repairing parts of locomotives which were in direct tension, and the practice would seem to have many possibilities for producing serious results. Autogenous welding processes are not a cure-all for all locomotive breakages and their use for some of the purposes indicated is likely to prove a set-back to their development along legitimate lines.

Locomotive Smoke Prevention

That the prevention of locomotive smoke is an all-absorbing and important question to roads operating in cities which have smoke ordinances there is no question. The roads that are not now handicapped with city ordinances should profit by the experience of those that are and see to it that the cities which they serve do not find it necessary to even think of smoke ordinances. This can only be done by concerted action on the part of all the roads. It will be found much more satisfactory, and far cheaper, for the railways to show a sincere disposition to keep the locomotive smoke as unobjectionable as possible. While the report of the committee on Smoke Prevention discloses very amicable relations between the city smoke inspection bureau and the railways in Chicago, it will be realized that this is possibly more of an exception than the rule. The committee describes clearly the method followed by the railways entering Chicago and it could very well serve as a guide to those roads that are farsighted enough to get together and forestall objectionable ordinances.

The Mechanical Stoker

If there were any doubts as to the success of the mechanical stoker in locomotive service, they would be removed by a perusal of the committee report presented at the recent convention of the International Railway Fuel Association and the report of the stoker committee of the Master Mechanics' Association. In the words of the former committee, "the stoker has arrived." Concerning fuel consumption, there seems to be as yet very little definite information, but there is no question that stoker-fired locomotives are capable of hauling greater tonnage than the same engines hand-fired because of the stoker's ability to maintain steam pressure under conditions beyond the physical limitations of the fireman. Like all new machinery, the mechanical stoker has had to pass through a period of development; some parts have had to be strengthened, some eliminated and others added. Because of this development work the cost of stoker maintenance, as referred to in the Master Mechanics' committee report, has not been reduced to the point which might have otherwise been reached. But it is encouraging in this respect to learn that efforts are being made to confine the failures to

places where repairs can be conveniently made. Attention is also being given to the matter of a better arrangement of the parts of the locomotive which are affected by the application of a stoker. It would seem that in the case of new locomotives which are to be equipped with stokers, opportunities are presented for simplifying and otherwise improving the machine by co-operation between the locomotive and stoker designers. The stoker designer is frequently confronted with severe limitations in applying a stoker to an existing locomotive, but there does not seem any good reason why he should not be given a better chance in the case of new power. The report of the Master Mechanics' committee also disposes effectively of the doubt as to the possibility of producing a stoker that will handle run-of-mine coal.

Centralized Control of Associations

The recommendation of President Gaines in his opening address, for the formation of one mechanical association to assume direction and control of the various associations now in existence, seems a good one. Just how the plan would be worked out would, of course, have to be determined by conferences of all those concerned; but there does not seem any reason why the various associations should not retain their individuality to a considerable extent, while the centralized control of such matters as the subjects acted on by the various committees and presented for discussion should be the means of eliminating much of the duplication of effort and working at cross-purposes which is now evident to anyone who attends many of the mechanical conventions. We believe that much good could come from such an organization and that this recommendation should not be set aside without further attention, but that on the contrary every effort should be made to develop some logical plan to concentrate the efforts of the various associations to a much greater extent than is now possible.

RECLAMATION OF MATERIAL

IN the *Railway Age Gazette* of May 21, 1915, page 1039, there was published an abstract of the Railway Storekeepers' Association committee report on the reclamation of material. The discussion of the report brought out a number of points which seem worthy of the most careful consideration. One of the principal of these was that of applying the recommendations of the committee to any particular road. It should be remembered in connection with reports of this nature that because of the great number of plants which are visited and taken into consideration, with conditions varying in many respects, the findings cannot be anything but general in character, and while they should be of the utmost value as a guide for anyone wishing to install a reclamation plant, they should be used as a guide only and no attempt be made to adhere rigidly to the recommendations when conditions may be so different as to make this impracticable. This is particularly true in the case of labor conditions, which vary so in different parts of the country and on different roads, that methods which give satisfaction on one road might prove inapplicable on another. The report of this committee and the various published articles dealing with reclamation work on different roads throughout the country may be made of great value in the installation of a plant on any road, but if such a plant is to be a success the final details will have to be worked out to meet the local conditions.

Another point that should be borne in mind is that the foreman of a plant for reclaiming material is naturally anxious to make as good a showing as possible, and his overenthusiasm may, in consequence, lead him into practices that are not economical. Cases are not wanting where material has been "reclaimed" only to be found useless after a considerable expense has been involved in the work of reclaiming it. It is easy to imagine a reclaiming plant, because of such practices, wasting a considerable percentage of what the plant is saving in other directions. There is a difference between reclaiming material and repairing it. There is a great deal of material now going through reclamation plants for which credit is being taken for reclamation when, as a matter of fact, the material is only repaired, and cannot in any sense be considered as scrap reclaimed. Carrying this a little further, there is much material now being reclaimed which should never have been scrapped at all, much of it being in first-class condition. The reclamation of scrap material has been proving of great value as a money saver to those railways that have put it into effect, but it should be remembered that, like almost anything else, it can be overdone, and it is well for those who are in touch with this work to keep in mind such points as those above indicated.

THE MECHANICAL DEPARTMENT AND OPERATING RESULTS

IT behooves every railway officer to look about him frequently and take account of himself and of the results he is producing for his company. To be sure, if he is not producing reasonably satisfactory results, he will be told of it by those above him in no uncertain language. But there is, or should be, more to the question of "satisfactory results" than the mere matter of a man's pride or self-satisfaction in the knowledge that he is keeping up his end of the game about as well as anyone else on the road. Are these results, that are approved by the higher officers, as satisfactory to you as they might be? Are the methods employed in obtaining them the best you can develop? Are you trying only for results that will "get by," or are you extending every effort to produce real economy and at the same time improve operating conditions?

A certain division operates for three months without an engine failure. Naturally the master mechanic is proud of it. But he may be of the type of men who are content to rest on this record; he may believe that his organization is so perfected that his division will continue to operate with a minimum of failures. If he is wise he will look carefully into the matter to see where he can find possibilities for improvement—breaks in his fences which, if left unheeded, may produce an engine failure record of another character. The time has never been, and certainly is not now, when a railway man can afford to view his achievements as the best possible under the conditions; if he is going to keep up with the game he must be just a little bit ahead of it all the time.

On the methods pursued in building up and maintaining an organization depends much of its success. We are all used to hearing railway men say, "We have very bad labor conditions on our road." Undoubtedly, labor conditions are bad on very many roads; but, Mr. Mechanical Department Officer, what steps are you taking to improve them? Are you following the policy of let well enough alone, and trusting that nothing will arise to start any trouble? Or are you ever on the alert, in close touch with the conditions on your road and making every step count toward better relations with the men? The labor problem cannot be solved over night by any one man; but every mechanical department officer can help toward better relations between the company and its employees. The road foreman of engines can accomplish much with enginemen; haggling over little things of minor importance does much to antagonize this class of men. Engine house foremen and shop foremen can assist the road foreman in this respect, and can also go far toward building up a better feeling among the shop men.

On the master mechanic rests the responsibility of either finding or developing the right kind of foremen—men of character and with ability to control those under them without antagonizing them. And for the higher officer there is the necessity of making a wise choice of his immediate subordinates and instilling the spirit of harmony into the entire force, for his attitude is more than likely to be directly reflected in the attitude of those under him. In the final analysis, the type of man who holds a minor official position depends on the type of man at the head of the organization.

TODAY'S PROGRAM

Discussion of reports on:

Locomotive headlights	9.30 A. M. to 10.15 A. M.
Design, construction and inspection of locomotive boilers	10.15 A. M. to 10.30 A. M.
Standardization of tinware	10.30 A. M. to 10.45 A. M.
Superheater locomotives	10.45 A. M. to 11.30 A. M.
Fuel economy	11.30 A. M. to 12.00 M.

Individual paper on:

Variable Exhausts. By Mr. J. Snowden Bell	12.00 M. to 12.30 P. M.

Topical discussions:

Tender derailments, causes and remedies. To be opened by Mr. H. T. Bentley	12.30 P. M. to 12.45. P. M.
Road instructions for enginemen and firemen	12.45 P. M. to 1.00 P. M.
Cross-head design. To be opened by Mr. A. R. Ayers	1.00 P. M. to 1.30 P. M.

ENTERTAINMENT

10.30 A. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

3.30 P. M.—*Orchestral Band Concert.* Entrance Hall, Million-Dollar Pier.

9.30 P. M.—*Informal Dance.* Special Feature, Costume Recital, Miss Betty Lee. Ball Room, Million-Dollar Pier. Don Richardson Orchestra.

TINWARE EXHIBIT

The Committee on Standardization of Tinware announces that it has arranged with the American Car & Foundry Company to exhibit the standards recommended in its report at the exhibit space of that company. The exhibit was provided through the courtesy of the Johnson Manufacturing Company. I. G. Johnson is in charge of the exhibit.

COMMITTEE ON OBITUARIES

The following members were appointed to act on the Committee on Obituaries: For Mott E. Sherwood, of the Michigan Central, D. R. MacBain, E. W. Pratt and L. R. Pomeroy. For C. Phillips, of the New Orleans and Northeastern, C. F. Giles.

R. S. M. A. DISTRICT MEETINGS

Four new members of the Executive Committee of the Railway Supply Manufacturers' Association will be chosen on Saturday, June 12. The voting place will be the room, adjoining the enrollment booth, in which the executive committee holds its meetings; and the polls will be open from 10 o'clock A. M. to 12 noon.

LOCOMOTIVE ORDERS

The New York, Ontario & Western has ordered twelve 2-10-2 type locomotives from the American Locomotive Company to be equipped with Street stokers.

The Denver & Salt Lake has ordered eight Mikado locomotives from the Lima Locomotive Corporation.

CLEANING OUT THE BOOTHS

The Exhibit Committee calls attention to the fact that it is not necessary for exhibitors to bring men in from outside to clean their booths. A force of eight men and a foreman is employed by the committee to sweep all dirt from the aisles during the night, and the regular employes of the pier are expected to remove it from the aisles. Men are also kept on duty during the day to keep things clean. It is not only unnecessary, but undesirable to bring in cleaners besides those employed by the committee, because close supervision cannot be exercised over them, and in consequence things are likely to disappear from the booths. The committee requests that if the work of cleaning is not properly done complaint shall be made to it, and prompt attention will be given to the matter.

LOST

M. K. Barnum, superintendent motive power, Baltimore & Ohio, lost his Master Car Builders' Association ex-president's badge yesterday. It has his full name on it, and he will greatly appreciate the courtesy if the finder will return it to the *Railway Age Gazette* office.

SACRED CONCERT

As usual, a sacred concert will be given in the solarium of the Marlborough-Blenheim at 10.30 o'clock Sunday morning by the hotel orchestra. Through an inadvertence the announcement of this concert was not included in the printed entertainment program.

GET-TOGETHER MEETING OF NORTH WESTERN CLUB

An informal meeting of North Western Club will be held at the Shelburne Hotel at 8.30 o'clock Saturday evening. Its purpose is to enable all those attending the conventions who formerly were or are now employed on the Chicago & North Western to get together, and all of either class who are here are invited to be present.

PENNSYLVANIA TRANSPORTATION

The announcement was made at the meeting yesterday morning that transportation would be provided over the Pennsylvania if the request was made to the secretary of the association, Joseph W. Taylor. In accordance with the requirements of the law, such transportation must be limited to bona fide railroad officials only and cannot include members of boat lines, car lines or switching lines operated by industries.

HONORARY MEMBERS

The following were elected to honorary membership in the Master Mechanics' Association at the meeting of yesterday morning:

Rufus Hill, who joined the association in 1874 and continued as a member until 1880, when he resigned. He renewed his membership in 1892 and has maintained it to the present time. Mr. Hill is now past 80 years of age.

H. G. Beckhold, who has been a member of the association for 22 years.

SOCIAL GATHERING AND DANCE

The social gathering and informal dance held on the pier last night proved to be most enjoyable. As was predicted in The Daily, the change to holding this affair on the pier with its spacious dance floor proved a marked success. The program rendered by Don Richardson's Orchestra was the last word from New York, and the costume recital of Miss Betty Lee the finished expression of an artist. The committee in charge was composed of Burton W. Mudge, chairman; C. D. Eaton, C. D. Jenks, C. W. F. Coffin, H. W. Hegeman, A. MacRae, J. P. Landreth and L. Ingraham.

R. S. M. A. NOMINATIONS

The nominating committee, composed of A. L. Humphrey, Westinghouse Air Brake Company (chairman); Scott H. Blewett, American Car & Foundry Company; Walter B. Leach, Hunt-Spiller Manufacturing Corporation; H. I. Lord, Detroit Lubricator Company; E. P. Welles, Charles H. Besly & Company; George L. Morton, Galena Signal Oil Company, and J. Allan Smith, U. S. Light & Heating Company, has recommended the following for officers: For president, Oscar F. Ostby, Commercial Acetylene Light & Signal Company, New York; for

vice-president, Edmund H. Walker, Standard Coupler Company, New York. The nominees will be voted for at the annual meeting of the Railway Supply Manufacturers' Association, to be held in Convention Hall, Million-Dollar Pier, at 12 o'clock noon Saturday, June 12.

TURN IN YOUR GOLF HANDICAPS

Those intending to play in the golf tournament on Sunday are requested to give their club handicaps, club pars and average scores to F. H. Thompson at the booth of the *Daily Railway Age Gazette*. A large number of prospective players sent their handicaps to E. H. Bankard, Jr., who was to have served as chairman of the golf committee. Mr. Bankard unfortunately is unable to attend the conventions and it will therefore be necessary for those who sent their handicaps to him to turn them in again. D. E. Sawyer will serve as chairman of the golf committee in place of Mr. Bankard.

It is desired to have as many as practicable participate in the tournament. Those who have not brought clubs can rent them at the Sea View Club for a nominal sum. While it is desired to have the entries made early, they will be accepted at the first tee on the course up to the beginning of play on Sunday morning.

STREET STOKERS IN SERVICE

C. F. Street, vice-president of the Locomotive Stoker Company, states that there are now in actual service 583 locomotives equipped with the Street stoker. Of these 583 stokers, 184 are applied to Mallet locomotives, 287 to Mikados, 75 to engines of the Santa Fe type, 27 to Consolidations, 6 to Pacific type passenger locomotives, 3 to Mountain type locomotives and 1 to a locomotive of the Centipede type. In addition this company is delivering 34 stokers to the Chesapeake & Ohio, 24 of which are for new locomotives and 10 for application to existing engines, and has an order for the application of stokers to the 12 locomotives of the 2-10-2 type which are to be built for the New York, Ontario & Western.

A. E. MANCHESTER'S FIFTIETH ANNIVERSARY

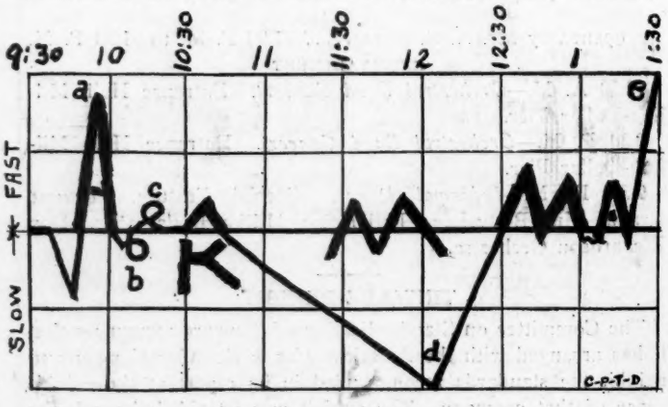
A. E. Manchester, superintendent of motive power, of the Chicago, Milwaukee & St. Paul, celebrated his fiftieth anniversary of continuous service with this road at Milwaukee on December 16, 1914. He was tendered a banquet by 250 of his associates and friends. J. F. DeVoy, assistant superintendent of motive power, was the toastmaster and the address of the evening was made by Burton Hanson, general solicitor of the road. Mr. Manchester was presented with a loving cup and an autograph album containing the names of all officials under his jurisdiction. Later he received a bound volume of the addresses of the evening, together with various clippings from magazines and newspapers publishing an account of the banquet.

Mr. Manchester is 68 years old and started with the road as a machinist at Portage, Wis., now on the LaCrosse division, when the road operated but 46 locomotives. He has held, successively, the positions of roundhouse foreman, division foreman of engines and master mechanic, and was appointed assistant superintendent of motive power in 1893. He was appointed to superintendent of motive power June 15, 1901. He joined the Master Mechanics' Association in 1894 and the Master Car Builders' Association in 1907, having missed only two or three of the conventions since he started to attend.

The guests at the banquet included the Governor of Wisconsin, Emanuel Phillips; J. H. Hiland and E. D. Sewall, vice-presidents of the St. Paul road; J. W. Taylor, assistant to the president; J. T. Gillick, assistant to the general manager; W. S. Cooper, general superintendent, and several division superintendents; S. P. Bush, president of the Buckeye Steel Castings Company, and Mr. Manchester's predecessor, James McNaughton, vice-president, American Locomotive Company; Charles Ridell, Baldwin Locomotive Works; H. T. Bentley, superintendent of motive power and machinery, Chicago & North Western, and all of Mr. Manchester's subordinates who were able to attend.

JOE TAYLOR'S EFFICIENCY CHART

They made a lot of fun of Joe Taylor and his efficiency methods at the meeting on Wednesday morning, but at the end of the session Joe was able to get up and demonstrate that he had made a schedule for the first day's session which worked out with fairly good results, even if it did have a stormy time at various times during the morning. Some of the committee chairmen had to duck when Joe developed the fact that he was forced to lay out his program before all of the committee reports had been turned in. The meeting



(Puzzle: Can you find A. R. M. M. A.?)

Joe Taylor's Efficiency Chart

started out 15 minutes late but closed 10 minutes ahead of time. The following notes will explain the various kinks in the diagram:

a—High peak of President Gaines' address.

b—Treasurer's report—not "in the hole" as chart indicates.

c—Taylor's report—looping the loop.

d—Locomotive stokers—Time lost was due to no *failure*, but there were four makes of stokers on the engine and there was not coal enough to keep them all supplied—capacity, 15,000 lb. each.

e—The fog at this point of the chart represents only an infinitesimal part of the smoke prevention in Chicago.

ADDITIONAL EXHIBITS

We said that H. Baker & Company, Inc., were making an exhibition of tool steel in space 364 in our list of exhibitors yesterday. Everyone who knows anything about the tool steel business would know we meant H. Boker & Company, Inc.

The Camel Company announces the substitution of A. B. Wegener as attending the convention in its interests in place of A. B. Wegecier, as we stated in our list of exhibitors yesterday.

Jerome-Edwards Metallic Packing Company, Chicago, is to to be found in space 362 with models of super-heat packing. Geo. C. Jerome and N. Huggins are representing the company.

The Hulson Grate Company, whose home office is in Keokuk, Iowa, is showing a new device in locomotive grate at space 365. Mr. A. W. Hulson is explaining its merits.

A new coupler and samples of a new replacer are to be found in space 311, shown by the Kelley Railway Appliance Company, of Gradyville, Ga. The company is represented by A. C. Kelley and O. Starling.

The Simplex Air Brake & Manufacturing Company, of Pittsburgh, Pa., whose exhibit is to be found in space 614, is showing engine air brake equipment. Milton D. Hays, the president, and Peter Wertz, the inventor, are in attendance, assisted by J. N. Weaver, Adam Goodwin and James Wardley.

Master Mechanics' Association Proceedings

Includes President's Address, Report on Stokers and Discussion on Compounding and Tender Side Bearings

The first session of the forty-eighth annual convention of the American Railway Master Mechanics' Association was held in Atlantic City, June 9, 1915. President F. F. Gaines called the meeting to order at 9.45 a. m. The past presidents and the officers of both the American Railway Master Mechanics' Association and the Master Car Builders' Association were invited to take seats on the platform. The opening prayer was made by the Reverend Doctor Newton D. Cadwell, Pastor of the Olivet Presbyterian Church of Atlantic City.

ADDRESS OF PRESIDENT GAINES

In looking over the developments of the past year, I do not recall any radical departure in locomotive design. There have been, however, developments along other lines which I recommend to you for the most serious consideration.

F. F. Gaines
President, Master Mechanics' Association

I will admit that personally I have been somewhat against the idea of one mechanical railroad association heretofore, believing that there was sufficient work and a broad enough field for the existence of the present organization. However, I think that the time has now come when we should have, under whatever title we may choose, one organization only, divided into such sections as may be found advisable. Most of the members of the various associations come under the jurisdiction of the mechanical department of a railroad. It would seem to me not only advisable, but very desirable, that some such new association should be formed to take over to a certain extent control of all the others. They need not necessarily meet at the same time; in fact, I think it would be better to spread the meetings out as at present, but the executive committee of the supreme association should pass upon the work of the minor associations.

Heretofore, the great argument for consolidation has been the saving of time, and I will admit frankly that my objection to consolidation has previously been on the basis that little could be done along this line; however, whether time can be saved or not seems to me a minor consideration and one that can be determined later. It is rather a question of having one recognized supreme authority on all mechanical matters pertaining to railroad work.

Until very recently the work of the Master Mechanics' Association has been more of an educational character with very few standards and very few specifications. This situation is now, of course, being changed, but I wish most urgently to call attention to the advisability of having standards for such things as it is possible to standardize in the way of methods, and also specifications for all classes of material used in locomotive

E. W. Pratt
First Vice-President, M. M. Association

work. Our standing committee has done some very valuable work, but I do not think we have nearly completed the task. We should be in a position at any time to say that such and such is our standard practice; or, that we have a specification for such material.

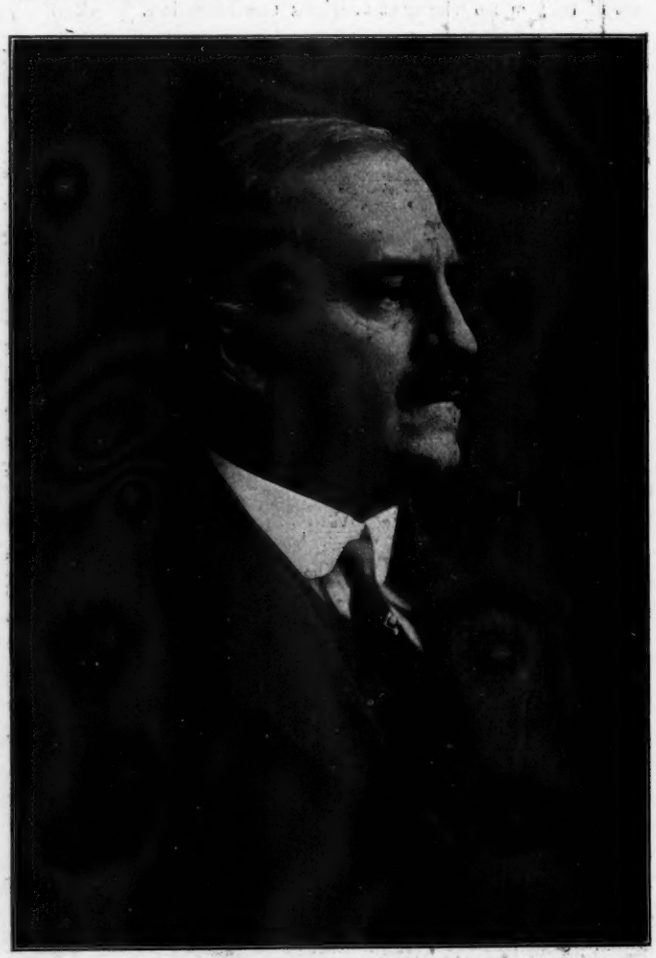
I would also suggest to the Committee on Specifications that in drawing up specifications for material they be not too rigid in their requirements; in other words, we want to obtain a fair grade of material under such specifications, but we do not want the specifications of such a nature as to involve a greatly increased cost, which would have the effect of a majority of the railroads not using them. After we have gone further into the matter in the way of standards and specifications a committee should be appointed to confer with the American Railway Association; the committee now in existence on Relations between Railways and Legislation might try to get the Ameri-

can Railway Association to lend its efforts toward the adoption by the railroads of such standards and specifications as the Master Mechanics' Association, or its successor, may produce.

I have several times, from the floor, called attention to the committees not issuing their reports until just a few days before the opening of the convention. It is exceedingly important that the committees get to work early in the year and have their reports in the hands of the secretary in time, so that they may be published and distributed at least two weeks before the opening of the convention. Many times it would add to the value of the proceedings and the information of the members were these reports available a sufficient length of time to allow of gathering data and investigating practices, so as to be able to discuss them intelligently and, perhaps, produce further information. A more thorough discussion of the reports would also add very largely to the value of our proceedings and the amount of information obtained.

Another matter that is worthy of consideration, is the greater use on the various committees of associate and

William Schlafge
Second Vice-President, M. M. Association



F. H. Clark
Third Vice-President, M. M. Association

honorary members. Many of these have had an excellent technical training, are familiar with committee work and possibly have a greater amount of time at their disposal than men actually in railroad service. It has been suggested to me by one such member that he would be only too glad to work on any committee, help them get their reports in shape and lined up in such form as to be readily investigated and in the best form for discussion.

I would like to suggest to the incoming Executive Committee the taking up of the form in which reports are prepared for the association. It has been suggested that all reports should be indexed on the margin for ready reference, that the logical handling of the subject be followed through consecutively and that the report, in general, be made as clear and concise as possible.

We have now, to a greater or less extent, adopted the principle of representative membership in the Master Mechanics' Association. This should be further encouraged and those roads which have not taken out representative membership should be urged to do so, as there is no good reason why every railroad of any consequence should not recognize its obligations to make common cause for the common good and unite to consummate the objects for which the association exists, until we have practically a complete representative membership, the same as in the Master Car Builders' Association.

It would seem from reports that we are not giving thorough enough training to our inspectors who look after the Federal boiler law, safety appliance and other Interstate Commerce orders. It has also been recommended that the railroads pay more attention to the educating of road foremen of engines, enginemen and firemen, and provide a more thorough examination for firemen before promotion.

The University of Illinois has an elaborate testing plant, large enough and of sufficient capacity to take the heaviest locomotive that is built, and it has been suggested the matter of testing locomotives and appliances be conducted on this plant and the results furnished the members of the association, the railroads to bear the expense in proportion to the number of locomotives owned. A test under such conditions would be cheaper to make than if actual road tests were made by any single road, and on account of the locomotives being under cover and not subjected to the variations of temperature, etc., conditions would be practically uniform for all tests.

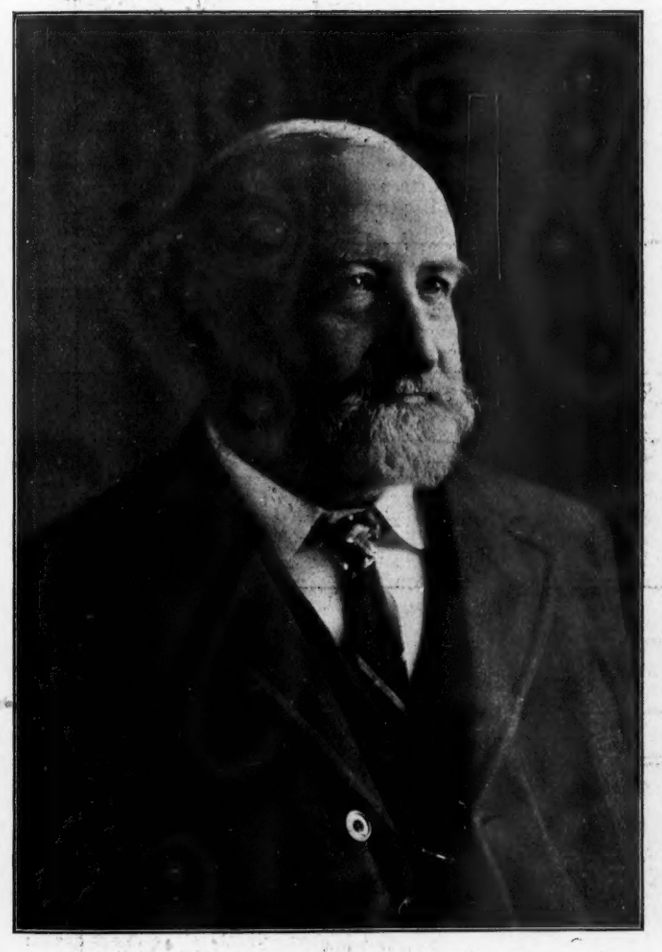
[Reference was made at this point to the promising outlook as the result of experimental work in the use of pulverized fuel and induced draft.]

Consideration should be given to the developing and refining of present types of locomotives on economic lines rather than size or weight solely. Furthermore, while this association discusses engineering questions and questions of locomotive practice; it does not go very deep in the discussion of whether investment in either equipment or appliances brings returns on the investment. Do we investigate sufficiently the question of what becomes of the dollar

that we spend for these items? Very little is heard concerning cost. It might also be well to give consideration to the cost of doing various standard classes of work in different shops, so that those of us who are working inefficiently may see just where the leaks are and make the necessary changes to reduce the expense. Every member of this association should put himself in the attitude of a business man towards a dollar. As items that would be of interest to all, I suggest a partial list: Cost of small tools and supplies; cost of power in power houses; comparative costs and results from using Thermit, oxy-acetylene end electric welding; cost of tube work, turning locomotives, staybolt renewals, spring repairs, turning driving wheels, and fitting up driving boxes, shoes and wedges. If basic figures could be obtained on these, we could work more intelligently towards reduced cost.

Do we know, when a new engine of a new type is put in service whether its increased weight, capacity and cost are justified? Do we follow up this matter and obtain sufficient data to justify our expenditures? Do we know when a new and improved machine tool is purchased and placed in the shop whether or not the cost is justified by the output?

The theoretical advantages of the superheater are well known; the practical saving in cost that can be accomplished is well known; but do we know that we are getting anything like this in every day service? Do we keep behind our roundhouse foreman to see that tubes are cleaned, superheater surfaces kept clean, joints kept tight, and that the proper handling for best results on the road is being carried out? If we do make these investigations, do we keep the operating department informed of them? Do we keep them informed as to results of improved devices and designs? Do we give information as to costs to subordinates in correct form so that they may analyze the results and endeavor to make reductions?



Angus Sinclair
Treasurer, M. M. Association

J. W. Taylor
Secretary, M. M. Association and M. C. B. Association

ASSOCIATION BUSINESS

The minutes of the last meeting were approved by the association.

The secretary's report showed the following figures regarding membership: Active, 979; associate, 19; honorary, 47, making a total of 1061. The report of the treasurer showed a cash balance of $1,213.28.

The report of the treasurer was received and referred to an auditing committee consisting of W. E. Dunham (C. & N. W.); M. D. Franey (N. Y. C.), and M. H. Haig (A. T. & S. F.).

The secretary reported on the two students attending the Stevens Institute of Technology on the Association's scholarships, stating that there are two vacancies in the scholarships at this Institute. He also stated that Joseph T. Ryerson & Son have increased the amount of their annual donation to cover two scholarships of $300 each, to take the place of one scholarship of $500. It was also arranged to increase the number of educational institutions at which the scholarships would be available. One scholarship will be vacant in June, 1915. Another scholarship will be available in 1916.

The secretary also referred to the proposed change in the constitution submitted last year in regard to the payment of dues. It was proposed to change Article III, Sec. 3, to read as follows:

"All active and associate members of the Association excepting as hereafter provided, shall be subject to the payment of such annual dues as it may be necessary to assess for the purpose of defraying the expenses of the Association, provided that no assessment shall exceed $5 a year."

In Article III, Sec. 3, Paragraph 2, it is proposed to have it read as follows:

"A representative member shall pay in addition to his personal dues as above, an amount for each additional vote to which he is entitled, as shall be determined each year by the Executive Committee, prorated upon the cost of conducting

such tests as may be determined upon at each convention."

These amendments to the Constitution were adopted.

The President: We have been pretty hard pressed financially for the last three years; quite a large number of the roads in various parts of the country have taken representative membership, and that has helped us out to some extent, but many of the roads have not done so. I hope you gentlemen will urge whoever may be the proper party with whom to take up this matter, that they will approve of the members of the Association acquiring this representative membership, because it is quite necessary for us to have the money which such representative membership will bring if we are to prosecute the work of the Association in a diligent manner.

The Secretary: At a meeting of the Executive Committee held last evening the question of a change in the hour for holding the election of officers, which was referred, during the closing hours of the convention of 1914, to the Executive Committee, was considered. It was thought that the plan now in force in M. C. B. Association, should be adopted by this Association and to conform thereto changes in the Constitution have been proposed. These changes will lie over until the next convention, in accordance with the requirements of the constitution.

At a meeting of the Executive Committee held last evening it was decided to recommend that the dues of active and associate members be fixed at $5 per year and representative members at $7 per one hundred engines per year.

(The action of the Executive Committee was approved.)

The Secretary: I move that W. C. Hayes, as the representative of the Traveling Engineers' Association, be accorded the privileges of the floor during this convention. (The motion was seconded and carried.)

LOCOMOTIVE STOKERS

Another year's experience with the locomotive stoker strengthens the conviction that it is not only accomplishing its purpose but withstands the test of continuous service with remarkable durability. Designs are being studied with the view of fixing the point of failure where repairs can be conveniently made, preferably without a road delay, and when it so happens that repairs can not be made on the road, the emergency can be met by resorting to hand firing until terminal is reached. The theory that the parts of the stoker be amply strong and in excess of the strength of the engine has its advantages.

In the consideration of designs, attention is being given the

A. Kearney
Chairman, Committee on Mechanical Stokers

matter of accessibility of parts, as well as certain features of the locomotive that are now, in some cases, difficult to reach on account of the stoker. Any of the stokers now in extensive use will, it seems, occasionally become inoperative by clogging. Viewing the prevention of foreign matter reaching the vital parts of the stoker as probably impracticable, the use of a reversible engine has been advocated, and, in fact, is receiving attention.

Time and experience have brought progress in the way of improving the manipulation of the scatter-type stokers, both in the care of the machine, as well as in a more efficient use of fuel. Instructions and experience have effected marked improvement on the operation of the stokers, and now it is rather rare to find a fireman disturbing the grates so long as a sufficient steam pressure is maintained to handle the train efficiently and successfully. The maximum depth of the fire should vary with the physical character of the coal, and to a degree with the chemical constituents in the ash. The committee is of the opinion that where the fireman will use his judgment the operation can be successfully manipulated with less physical exertion, and this precaution will result in reducing loss of fuel through the grates and relief valves, as well as reducing the physical effort on his part.

The cost of stoker maintenance has been somewhat affected in the aggregate during the past year by the modifications, improvements and changes introduced currently. From data gathered from the scatter-type stokers in more extensive use, the cost per 100 miles ranges from 43 cents to 68 cents, and the miles run per failure from 1000 to 5000.

Since the advent of the locomotive stoker it has been an open question as to whether it is more economical to prepare coal at wharves or on the tender of the locomotive. The aggregate cost of maintenance of a crusher at a wharf may be less than that for a number of locomotives, and it should not be forgotten that while crushers may be obtained that will fairly well handle the major portion of foreign matter found in fuel, it is conceded difficult to cope with such conditions after it reaches the locomotive. Regardless of this, however, it may be economical to equip locomotives with individual crushers on account of the proportion or volume of fuel supplied.

During the past year the Norfolk & Western put in operation sixteen Hanna and thirteen Standard stokers. The twenty-nine stokers were provided with crushing facilities on the tender to handle run-of-mine coal. The first few months these stokers were in operation some trouble was experienced while using run-of-mine fuel containing a large proportion of lump, on account of the presence of foreign matter. This, however, has been practically eliminated, or at least very much reduced, by constructing the conveyor to carry such foreign matter within reasonable sizes through to the fire bed with the fuel.

The past year has been marked by the successful performance of the Hanna and Standard stokers, which at the time of the committee's last report had been in actual service but a few months. Fifteen Hanna stokers have been applied to Mallet engines (2-6-6-2), 72.2 sq. ft. of grate area, and twelve Standards to Mastodon engines (4-8-0), 45 sq. ft. grate area, on the same road. They are handling sometimes slack and in other cases run-of-mine coal, from which the product under 2½ in. has been screened. The locomotives equipped with these stokers have been put in general fast and slow freight service, and in many cases the hardest runs on the division for which the respective types of locomotives are selected. These stokers, as well as the Street, have continued their successful work, each having its characteristic features.

The following stokers are reported in active service: Crawford, Street, Hanna, Standard, Kincaid, and Ayers.

Crawford Stoker. (*Underfeed.*)—At the present time there are 282 Crawford double-underfeed stokers in operation on the Pennsylvania Lines West of Pittsburgh. The stoker is still the only underfeed type in service. In addition to these 2 are being tried experimentally on the Bessemer & Lake Erie, 4 on the Vandalia and 3 on the Pennsylvania Lines East of Pittsburgh, making a total of 291 in service. It is reported that a new pattern of the Crawford stoker, known as type "30," is being constructed for test.

Street Stoker. (*Overfeed or Scatter Type.*)—The Street stoker still shows the largest number in service, totaling 531, with 24 on order. The type *C* stoker, which is the latest design, has a variable-speed engine and a friction clutch, instead of differential gear that was employed in the earlier type machines. The type *A* machine carried a crusher on the tank, but in the latter designs the crusher was set aside, the conviction being it was better under certain conditions to supply the fuel that would pass through the 2½ in. mesh on the locomotive tender. These stokers are in operation on fifteen railroads. The Street stokers are operated in passenger, general fast and slow freight service, performing their work satisfactorily. The machines have done remarkable work, on account of their durability, and nothing more is needed in their favor than their record and applications made. The principle upon which the machine is designed and operates is very widely known.

Hanna Stoker. (*Overfeed or Scatter Type.*)—The Hanna stoker is equipped with durable crushing facilities on the tank, consisting of a heavy helicoid conveyor screw and a bulkhead containing a restricted opening, partly encircled by two stationary knives. Coal is forced through the restricted opening in the bulkhead by the revolving conveyor screw, assisted by the two stationary knives for breaking the larger lumps. This stoker handles slack as well as run-of-mine coal quite efficiently,

regardless of weather conditions and moisture of the fuel. In the event of one of the stokers breaking down, it does not necessarily mean a failure, as the stoker is provided with two distinct recourses to be utilized in such emergencies; first, if any part of the tender conveyor becomes inoperative, the conveyor can be thrown out of operation by means of a clutch and the coal can be shoveled into the locomotive hopper through an opening in the deck; secondly, if the entire stoker becomes inoperative, coal can be shoveled to the plate by hand, from which it is driven to any section of the firebox by means of a blasting chamber and distributing plate. With the assistance of the distributing wings, which is a feature of the machine, the use of the fire hook is materially decreased.

Standard Stoker. (*Overfeed.*)—The Standard stoker is equipped with adequate crushing facilities on the tank, consisting of a durable helicoid conveyor screw and a bulkhead having a restricted opening partly surrounded by fixed center-punches. Coal is forced through the opening in the bulkhead by the revolving conveyor screw, assisted by the stationary center-punches for crushing the larger lumps. The apparatus is so constructed that it will handle moist coal quite satisfactorily. During the past year 20 Standard stokers have been put in operation, making a total of 22 in actual service. These stokers are being operated in slow and fast freight service, and are working satisfactorily. As has been previously explained, the stoker is under the deck of the engine, leaving the deck and boiler head clear. The machine makes very little noise in its operation, has a good distributing feature, and is very simple in its control. The latest development of the stoker is the type *AB*, which we understand possesses a number of distinct improvements over the type *A* stoker.

Gee Stoker. (*Overfeed or Scatter Type.*)—The Gee stoker continues in service on a consolidation locomotive on the Pennsylvania Lines East of Pittsburgh. It is still undergoing development.

Kincaid Stoker. (*Overfeed or Scatter Type.*)—The Kincaid stoker, which for the past year has been under development on a Chesapeake & Ohio yard engine, continues to progress. The distributing features of this stoker are attached to the fire door. Coal is shoveled into a hopper elevated in front of and attached to the door, from which it gravitates to a distributing apparatus and is delivered to the firebox. It is reported that a conveyor has been worked out and will be applied.

Elvin Stoker. (*Overfeed or Shovel Type.*)—The Elvin stoker is of rather novel construction, and is the only one that has not substituted some other device or devices for the scoop. A number of stationary tests have been made with the stoker, and it is thought that within the near future the machine will be tested out on a locomotive.

Raite Stoker. (*Underfeed or Overfeed.*)—The Raite stoker, claimed by the inventor to be either an underfeed or a scatter type, is the only one which the committee has any knowledge of that embodies a combination of the two methods. George B. Raite, of Indianapolis, advises that this stoker is still being developed and will soon be ready for application. The inventor further claims that special features were recently worked out which should materially improve the distribution of coal and aid combustion.

Ayers Stoker. (*Chain Grate.*)—The Ayers stoker, the sole member of the traveling-grate-type family, reports progress. Last summer and fall a number of experimental trips were made with this stoker as applied to a N. Y. C. engine, the results of which are reported to be encouraging. During the past winter the stoker has been further developed, and it is thought that it will soon be ready for service.

The following is a list of the operative stokers:

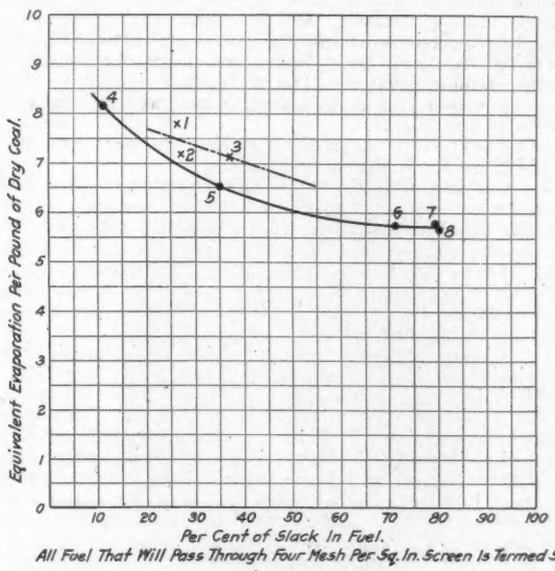
	Stokers in Active Service.	Stokers on Order.
Street	548	35
Crawford	301	31
Hanna	18	6
Standard	28	92
Gee	1	0
Ayers	1	0
Kincaid	1	0

Records have been taken during the past year with the scatter-type stoker in road service, and among others, observations were made on the Norfolk & Western, with a 4-8-0 locomotive having 24 in. by 30 in. cylinders, 200 lb. steam pressure, and a tractive effort of 52,457 lb.

Analyzing the results relating to fuel consumption, it was apparent that the amount of coal consumed varied according to its physical characteristics. The significance of the effect of the physical properties of the fuel stoker fired is shown in the accompanying chart, representing the relation between equivalent evaporation per pound of dry coal and the proportion of physically fine product in the fuel. It is found that the evaporative values of the coal vary inversely with the amount of the slack content. By the latter is meant the amount of fuel that passed through a 4-mesh-per-square-inch screen. It will be observed from the table giving the analysis of the different fuels considered that the variation in fuel consumption were hardly influenced by the difference in the quality of the fuel, except as it varied in physical properties.

For the Pocahontas nut fuel, which contains 11 per cent slack, the equivalent evaporation was 8.2 lb. of water per pound of dry coal, while for the Pocahontas slack, of practically the same heat value, but where the percentage of slack was about 80 per cent, the equivalent evaporation was only 5.6 lb. of water per pound of dry coal. Since these varying conditions of consumption were obtained while hauling the same identical train, with no change made in the drafting or any other feature of the locomotive, it was concluded that the fuel consumption with coal containing a higher percentage of the finer product took place, on account of a large percentage of the latter being carried through the flues and out through the stack before being completely consumed.

In conclusion it seems safe to say that the mechanical stoker has demonstrated by extensive service that it is capable of supplying coal to a locomotive firebox at a rate and under sufficient control to satisfactorily maintain the working steam pressure. It is also obvious, being a machine and working continuously, it should be capable of maintaining a more regular rate of steaming



All Fuel That Will Pass Through Four Mesh Per Sq. In. Screen Is Termed Slack.

No.	Kind of Coal.	Per Cent Slack.	Vol. Mat.	Ash.	B.T.U.	No.
1	Thacker slack.....	26	31.46	7.46	13385	1
2	Thacker slack.....	27	31.60	7.30	13455	2
3	Thacker slack.....	38	31.12	6.14	13725	3
4	Poca. nut.....	11	19.36	6.68	14058	4
5	Poca. rom.....	35	18.20	6.18	14105	5
6	Poca. slack.....	72	18.96	6.00	14028	6
7	Poca. slack.....	79	18.64	5.26	14260	7
8	Poca. slack.....	80	18.36	4.78	13337	8

Curve Showing Influence of Physical Properties of Fuel Upon Boiler Performance with Scatter Type Locomotive Stoker

with certain grades of fuel than might be obtained in average hand-firing practice. Greater work is done with the stoker, in terms of speed or tonnage, or both, under certain physical and operating conditions, while in another service with equally large engines and heavy tonnage, but under more favorable grade line and fuel conditions, as high efficiency has been obtained hand-firing.

As interesting as it would be to define the relation between hand and stoker firing, it is as difficult of determination as the fixing of the rate of efficiency for hand-firing. Many observations have been made and the range of possibility has been fairly well determined, but as can be appreciated, the enormous variable introduced by fuel and physical conditions makes the problem very complex.

The committee feels itself unable to point to any rule in terms of weight of engine or train load, or general conditions, where the stoker will always be applicable or necessary on account of the wide range of physical and operating conditions, as well as character of fuel, and the question of fuel is by no means a minor factor, for the reason that the choice of available coals demands consideration of their character as well as price, as the net result of using some of the finely divided grades of stoker-prepared or mixed coal may be offset by a more attractive rate of consumption, better evaporation, and lower cost per ton-mile

with run-of-mine after it has been crushed to the desired grade.

The report is signed by:—A. Kearney (N. & W.), Chairman; M. A. Kinney (H. V.); T. R. Cook (Penn. Lines); J. W. Cyr (C., B. & Q.); A. J. Fries (N. Y. C.); J. T. Carroll (B. & O.), and J. R. Gould (C. & O.).

DISCUSSION

A. Kearney (chairman): Some reference is made indirectly in the report to the damage to coal handled through the stokers. You will notice the committee speaks of run-of-mine coal being handled through the stoker, as compared with the same coal hand fired. That is on account of the further crushing of the coal as it passes through the helicoid screw. That is quite reasonable, and it was also noticeable in the results.

W. C. Hayes, Erie: I would like to ask if attention has been given to the question of the relative difference in the cost of the stokers and their value to the roads on which they are used.

Mr. Kearney: In order to get at the figures Mr. Hayes has mentioned, we would probably have to make a determination as to just how far we will be justified in spending money for a stoker. That has never been worked out.

L. R. Pomeroy: A locomotive with from 4,500 to 5,000 sq. ft. of heating surface, would require over 8,000 lb. of coal per hour. If it established that the stokers could easily handle 8,500 lb. of coal per hour, and the ordinary fireman can only handle 4,500 lb., the difference ought to be a measure by which you could compare and rate this economy and value of the stoker.

Mr. Kearney: On our stoker engines we have run up to about 12,000 lb. per hour.

D. R. MacBain (N. Y. C.): The mechanical stoker will increase the hauling capacity of the large locomotive, on such as they are installed, anywhere from 250 to 500 tons over what can be hauled with a fireman, and it seems to me that when you get into figures of that kind, that a few hundred dollars in the initial cost of the stoker applied to the locomotive might very consistently be lost sight of for the time being, while the developing is going on.

W. C. A. Henry (Penn. Lines): The Pennsylvania Lines West, within the last month, have ordered 50 consolidation locomotives having a tractive power of 53,000 lb. They were all to be equipped with the Crawford stoker. The stoker enables us to get about 8 to 10 per cent more ton miles per hour on the road, which makes it an attractive proposition. None of these locomotives have brick arches. Our passenger locomotives, however, where the fire box is deep enough to permit it, have arches. We have found the reversing mechanism for the stoker to be very nice, and all are being equipped with a very simple mechanism, by which the direction of the travel of the piston can be reversed at any time. There is no special preparation required as we simply use run-of-mine coal. The conveying mechanism, however, is so constructed that in case of a lump of such size that would interfere, the conveyer will not find it. If it finds its way to the opening of the conveyer mechanism, it will be broken.

M. K. Barnum (B. & O.): Stoker failures on the Baltimore & Ohio are very rare. From memory I should say that with about 223 stokers we are not having more than one or two failures a month, and those are of minor importance. We are getting excellent results on our power and in fact are operating some 2-10-2 locomotives with the stoker, which are probably larger than we could operate by hand firing. and get anything like satisfactory results.

W. E. Symonds: In connection with the item of the relative cost of the stoker, it has occurred to me to be not improper to suggest that the cost of a stoker at present might properly be compared with the salary of an additional fireman, which would be necessary on the large type of locomotives in order to work them to their capacity with hand firing.

C. F. Street (Loco. Stoker Co.): The important feature of the stoker is this question of increased capacity, and all these other features sink into insignificance when compared with it. I have never claimed that the locomotive stoker would save fuel. On the other hand, there are a great many devices which are put on the locomotives which will save fuel but are being used as economy increasers instead of fuel savers. The superheater is first and essentially a capacity increaser in actual service. Theoretically it is also a fuel saver. The stoker is essentially and only a capacity increaser. The stoker has made possible the building of locomotives which could not be run without stokers. I think none of the 2-10-2 types of locomotive, which have been introduced within the last year, and which was referred to by the president in his address, would ever have been built, had it not been known that a stoker could be secured for firing.

This increased tonnage possible with these larger locomotives is best illustrated by a remark made by A. N. Willsie, of the Chicago, Burlington & Quincy, at the recent convention of the International Railway Fuel Association held at Chicago, where he made a statement that the 2-10-2 type of locomotive, stoker fired, will haul 1,483 more tons than with a hand-fired Mikado, and that is a Mikado having 60,000 lb. tractive power. I said the stoker is not a fuel saver. He said the cost of coal per 10,000 ton miles is 34 cents, as against 45 cents for the Mikado, hand-fired.

Regarding the question of maintenance, we have been aiming at 50 cents per 100 miles and that varies in accordance with the manner in which the records are kept. Some roads keep records which include the cost of inspection in the cost of maintenance, and some would ignore that. It just depends on the way the records are kept. The same thing is true with regard to failures. I cannot help think that the miles run per failure of 1,000 to 5,000 is pretty low. I had a report recently from a superintendent of motive power, saying that his stoker fired locomotives had made 90,000 miles without a record of stoker failure at the present time. It just depends on what you call a stoker failure.

This report gives a curve which shows that the rate of fuel consumed, the water evaporated, varies in proportion to the amount of slack in the fuel. That is absolutely true up to a rate of burning of from 60 to 70 lb. of coal per square foot of grate. The water evaporated per pound of coal up to that point is not affected materially by the amount of slack in the coal, but when you get up to burning 120 to 150 lb. of coal per square foot of grate, the efficiency falls off in proportion to the amount of slack in the coal; and exactly the same thing is true in hand firing. I have seen reports of tests where there was an increase in the coal consumption of 20 per cent, owing only and absolutely to the amount of slack that there was in the coal used for hand firing. The difference probably is about the same with stoker firing, but only at the high rates of burning. With the stoker there is no condition of a steam failure no matter how high a rate of burning is used, while with hand firing when you get above a certain proportion of slack in the coal, it is impossible to maintain steam pressure. With the stoker it makes no difference how much slack there is in the coal; in fact, it is possible to stoke a fire and maintain steam pressure with coal that needs no lumps in it at all any larger than a finger nail, but of course it will take a larger amount of coal to produce those results.

Another feature which is important, in the development of the stokers, is the ability to use a much lower grade of fuel. This condition obtains in the West more than in the East. I have seen 15,500 lb. of coal put through a stoker in an hour; this was for a short time. Under those conditions of course the locomotive did not burn it economically.

I would not say that under all conditions on large locomotives, that the application of a stoker would enable increased tonnage. There are undoubtedly conditions under which large locomotives are working at slow speeds, where the stoker will not give you any marked increase in tonnage. The important feature is increased tonnage and increased average speed of heavy freight trains. That is what the stoker has actually accomplished.

Mr. Kearney: The committee mentioned here that the stoker failures ran between 1,000 and 5,000 miles per failure. The information is obtained from the firemen, and it is obtained after going over the record very critically. Last year the failures were taken from the despatchers' sheets and there they ran up four times the figures now published.

(Mr. MacBain called attention to the importance of providing ample diameter of stack.)

E. A. Averill (Standard Stoker Co.): I would like to emphasize what Mr. Street has been saying in his remarks in connection with the stoker on locomotives, which is primarily a matter of increased power or the opportunity given to use the power that is in the locomotive. In one case where tests were made, carefully conducted tests, it developed that the application of stokers on that particular division, to those particular engines, would result in saving approximately $100. per engine per month. That was very largely due to increased tonnage, and partially due to the elimination of the second fireman during the hot months. The report states: "If now the same grade of run-of-mine coal is retained for hand-firing, and in comparison we use the same coal with the stoker, crushing it on the locomotive, we might expect to find a difference of probably ten per cent in evaporated efficiency in favor of hand-firing." It may be true, of course, in some cases, but the tests I have been on and several others have shown under those conditions mentioned, using the same coal, and crushing it on the tender, the stoker does not use any more coal hand-firing, and on another test, it ran as high as 7 or 8 per cent in favor of the stoker in equivalent evaporation per pound of dry coal. These deductions were gained from two separate tests. These tests indicate that the conditions in arranging for the test were

such that the stoker was not extravagant in fuel, and did not use any more fuel than in hand-firing. In the case where it was given the opportunity of developing the full capacity of the locomotive it showed an evaporated efficiency as high as 11 or 12 per cent on the same basis.

Mr. Kearney: Do not forget there is quite a difference between Pocahontas and the higher volatile coals, and that was particularly mentioned in the report, and it was stated that in other fields an entirely different condition would obtain from that which is obtained with the use of Pocahontas coal.

REVISION OF STANDARDS AND RECOMMENDED PRACTICE

After consideration of the present Standards and Recommended Practices of the Association, together with the replies received to the Circular of Inquiry sent to the members, and instructions and other information received from the Executive Committee and from the Secretary of your committee, would submit the following report:

[Only the most important changes which were approved of by the committee are given below.—EDITOR.]

SPECIFICATIONS FOR STEEL AXLES FOR LOCOMOTIVE TENDERS. (Standard)
Page 475.

The committee recommends the revision and modification in form of the present Specifications for Steel Axles for Locomotive Tenders, the requirements agreeing with the Standard of the M. C. B. Association.

JOURNAL BOX, BEARING AND WEDGE. (Standard and Recommended Practice)

For journals 6 in. by 11 in. Sheets M. M. L M and N.
Page 479.

A member suggests advancing these details to Standards from Recommended Practices. The committee concurs in the suggestion.

SPECIFICATION FOR BOILER AND FIREBOX STEEL. (Standard)
Pages 490-492.

The committee recommends the revision and modification of the present specifications for boiler and firebox steel as shown in Appendix *A*.

SPECIFICATIONS FOR LOCOMOTIVE DRIVING AND ENGINE TRUCK AXLES. (Standard)
Page 499.

SPECIFICATIONS FOR LOCOMOTIVE FORGINGS. (Standard)
Page 500.

The committee recommends the revision and modification of the present specifications for locomotive driving and engine truck axles and the present specifications for locomotive forgings and combining them in one, specifications for annealed and unannealed carbon-steel axles, shafts and other forgings for locomotives as shown in Appendix *B*.

SPECIFICATIONS FOR LOCOMOTIVE CYLINDER CASTINGS, CYLINDER BUSHINGS, CYLINDER HEADS, STEAM CHESTS, VALVE BUSHINGS AND PACKING RINGS. (Standard)
Pages 503-504.

The committee recommends the revision and modification of the present specifications for locomotive castings, cylinder bushings, cylinder heads, steam chests, valve bushings and packing rings as shown in Appendix *C*.

SPECIFICATIONS FOR CAST-STEEL LOCOMOTIVE FRAMES. (Recommended Practice)
Page 504.

The committee recommends the revision and modification of the present specifications for cast-steel locomotive frames substituting for them the specifications for steel castings for locomotives, as shown in Appendix *D*.

INSPECTION AND TESTING OF LOCOMOTIVE BOILERS. (Standard)
Pages 531-538.

The committee recommends the revision of these standards to conform to the latest revision in the Federal Regulations for the Inspection and Testing of Locomotive Boilers and their appurtenances.

NEW BUSINESS

Through the Secretary a communication was received advising that the Arbitration Board of the Master Car Builders' Association had been called upon for some rule in the Code to cover the use of brakes on locomotives handled dead in train and offered in interchange. An expression on this subject was requested from the A. R. M. M. Association, the details being referred to this committee. After considerable investigation the committee recommends the following regulations covering the operation of brakes on engines and tenders handled dead in train and offered in interchange:

1. All engines equipped with side rods must have them applied, when handled dead in trains, suitable washers, of wooden blocks clamped together with bolts, being used where necessary on main rod bearings to keep the side rods in place.
2. All engines and tenders hauled dead in trains must have the air brakes cut in and operative on drivers, trailers and on tender trucks.
3. Engines and tenders equipped with the Westinghouse ET, or New York LT brake must have the safety valve on the distributing valve, or control valve, adjusted to not less than 25 lb. or more than 30 lb.
4. Engines and tenders equipped with the automatic and straight air combined must have the safety valve in brake cylinder pipe adjusted to not less than 25 lb. or more than 30 lb.
5. Engines equipped with Westinghouse ET, or New York LT brakes, or with straight air must have positive stops applied to handles of automatic and independent valves to secure these handles in running position.
6. Engines and tenders equipped with high speed brake without the straight air, must have the high speed reducing valve set to reduce the brake cylinder pressure to not less than 25 lb. or more than 30 lb., or must have a safety valve applied to the brake cylinders or the brake cylinder pipe set to not less than 25 lb. or more than 30 lb.
7. Engines and tenders equipped with only the automatic brake must have a safety valve applied to the brake cylinders or the brake cylinder pipe set to not less than 25 lb. or more than 30 lb.
8. Engines fitted with power brakes other than air must be equipped with an air train line and connections.
9. Delivering line will be held responsible for flat spots on driving tires, trailer tires and tender truck wheels.
10. Owners shall be responsible for any special application of safety valves as required in Sections No. 3 to 8, inclusive.

The report is signed by:—W. E. Dunham (C. & N. W.), chairman; A. R. Ayers (N. Y. C.); M. H. Haig (A. T. & S. F.); A. G. Trumbull (Erie), and C. D. Young (Penn.).

W. E. Dunham
Chairman, Committee on Revision of Standards and Recommended Practice

APPENDIX A

SPECIFICATIONS FOR BOILER AND FIREBOX STEEL FOR LOCOMOTIVE EQUIPMENT

1. Scope.—These specifications cover two grades of boiler steel and shall be designated as flange steel and firebox steel.

MANUFACTURE

2. Process.—The steel shall be made by the open-hearth process.

CHEMICAL PROPERTIES AND TESTS

3. Chemical Composition.—The steel shall conform to the following requirements as to chemical composition:

	Flange.	*Fire-box.*
Carbon		0.12–0.25 per cent
Manganese	0.30–0.60 per cent	0.30–0.50 per cent
Phosphorus, not over	acid 0.05 per cent	0.04 per cent
	basic 0.04 per cent	0.035 per cent
Sulphur, not over	0.05 per cent	0.04 per cent
Copper, not over		0.05 per cent

4. Ladle Analysis.—An analysis shall be made by the manufacturer from a test ingot taken during the pouring of each melt, a copy shall be given to the purchaser or his representative. This analysis shall conform to the requirements in Section 3.

5. Check Analysis.—Analysis may be made by the purchaser from a broken tension test specimen representing each plate as rolled, which shall conform to the requirements specified in Section 3.

III. PHYSICAL PROPERTIES AND TESTS

6. (a) The steel shall conform to the following requirements as to tensile properties:

	Flange.	*Fire-box.*
Tensile strength lb. per sq. in.	56 000—85 000	52 000—62 000
Field point lb. per sq. in.	0.5 tens. str.	0.5 tens. str.
Elongation in 8 in. min. per cent	1 560 000 / Tens. str.	1 500 000 / Tens. str.

(b) The yield point shall be determined by the drop of the beam of the testing machine.

7. Modification in Elongation.—For material over ¾ in. in thickness a deduction of 0.5 from the percentages of elongation specified in Section 6 (a) shall be made for each increase of ⅛ in. thickness above ¾ in. to a minimum of 20 per cent.

8. Bend Tests.—(a) COLD-BEND TESTS.—The test specimen shall bend cold through 180 deg. without cracking on the outside of the bent portion as follows: For material 1 in. or under in thickness, flat on itself, and for material over 1 in. in thickness, around a pin the diameter of which is equal to the thickness of the specimen.

(b) QUENCH-BEND TESTS.—The test specimen, when heated to a light cherry red, as seen in the dark (not less than 1200 deg. F.), and quenched at once in water, the temperature of which is between 80 and 90 deg. F., shall bend through 180 deg., without cracking on the outside of the bent portion as follows: For material 1 in. or under in thickness, flat on itself, and for material over 1 in. in thickness, around a pin the diameter of which is equal to the thickness of the specimen.

9. Homogeneity Tests.—A sample taken from a broken tension test specimen shall not show any single seam or cavity more than ¼ in. long, in either of the three fractures obtained in the test for homogeneity, which shall be made as follows: The specimen shall be either nicked with a chisel or grooved on a machine, transversely, about 1-16 in. deep, in three places about two inches apart. The first groove shall be made 2 in. from the square end; each succeeding groove shall be made on the opposite side from the preceding one. The specimen shall then be firmly held in a vise, with the first groove about one-fourth inch above the jaws and the projecting end broken off with light blows of a hammer, the bending being away from the groove. The specimen shall be broken at the other two grooves in the same manner. The object of this test is to open and render visible to the eye any seams due to failure of weld or to interposed foreign matter, or any cavities due to gas bubbles in the ingot. One side of each fracture shall be examined and the length of the seams and cavities determined, a pocket lens being used if necessary.

Thickness Ordered. In.	Nominal Weight Lb. per Sq. Ft.	ALLOWABLE EXCESS (EXPRESSED AS PERCENTAGE NOMINAL WEIGHT). For width of Plate, as follows:						
		Under 50 in.	50 to 70 in excl.	70 in. or over	Under 75 in.	75 to 100 in. excl.	100 to 115 in. excl.	115 in. and over.
⅛ to 5/32	5.10 to 6.37	10	15	20	.....	.....	.....	.....
5/32 to 3/16	6.37 to 7.66	8.5	12.5	17	.....	.....	.....	.....
3/16 to ¼	7.65 to 12.20	7	10	15	.....	.....	.....	.....
¼	10.20	.....	.....	.....	10	14	18	.....
5/16	12.75	.....	.....	.....	8	12	16	.....
⅜	15.30	.....	.....	.....	7	10	13	17
7/16	17.85	.....	.....	.....	6	.....	10	13
½	20.40	.....	.....	.....	5	7	9	12
9/16	22.95	.....	.....	.....	4.5	6.5	8.5	11
⅝	25.50	.....	.....	.....	4	6	8	10
Over ⅝	.....	.....	.....	.....	3.5	5	6.5	9

11. Number of Tests.—One tension, one cold-bend and one quench-bend test shall be made from each plate as rolled and in addition one homogeneity test shall be made from each plate made into fire-box material.

(b) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(c) If the percentage of elongation of any test specimen is less than that specified in Section 7, and any part of the fracture is outside the middle third of the gaged length, as indicated by the scribe scratches marked on the specimen before testing, a retest shall be allowed.

IV. PERMISSIBLE VARIATION IN WEIGHT AND GAGE

12. Gage.—The thickness of each plate shall not vary more than 0.01 in. under that ordered.

13. Weight.—An excess over the nominal weight corresponding to the dimensions on the order shall be allowed for each plate, if not more than that shown in the preceding table, 1 cu. in. rolled steel being assumed to weigh 0.2833 lb.

[NOTE:—Only the more important paragraphs of these specifications are printed here.—EDITOR.].

APPENDIX B

SPECIFICATIONS FOR ANNEALED AND UNANNEALED CARBON STEEL AXLES, SHAFTS AND OTHER FORGINGS FOR LOCOMOTIVES

1. Basis of Purchase.—(a) These specifications cover annealed and unannealed carbon steel driving axles, engine and trailer truck axles, main and side rods, piston rods, crank pins and miscellaneous forgings.

(b) The manufacturer may, at his option, furnish annealed forgings when unannealed forgings are specified by the purchaser, provided they conform to the requirements specified for unannealed forgings.

I. MANUFACTURE

2. Process.—The steel may be made by the open-hearth or other process approved by the purchaser.

3. Discard.—A sufficient discard shall be made from each ingot to secure freedom from injurious piping and undue segregation.

4. Prolongation for Test.—The manufacturer and the purchaser shall agree upon forgings on which a prolongation for test purposes shall be provided.

5. Heat Treatment.—For annealing, the forgings shall be allowed to become cold after forgings. They shall then be uniformly reheated to the proper temperature to refine the grain (a group thus reheated being known as an annealing charge) and allowed to cool uniformly.

II. CHEMICAL PROPERTIES AND TESTS

6. The steel shall conform to the following requirements as to chemical composition:

Carbon	0.38—0.52 per cent
Manganese	0.40—0.75 per cent
Phosphorus, not over	0.05 per cent
Sulphur, not over	0.05 per cent

7. Ladle Analysis.—(Same as in Appendix *A*).

8. Check Analysis.—Analysis may be made by the purchaser from a forging representing each melt, which shall conform to the requirements specified in Section 6. Drilling for analysis may be taken from the forging or from a full-sized prolongation of the same, at any point midway between the center and surface, or turnings may be taken from a test specimen.

III. PHYSICAL PROPERTIES AND TESTS

9. Tension Tests.—(a) The forgings shall conform to the following minimum requirements as to tensile properties: For forgings whose maximum outside diameter or overall thickness is not over 12 in. when unannealed and not over 20 in. when annealed.

UNANNEALED

Size, Outside Diameter or Overall thickness	Tens. Str. lb. per sq. in.	Yield point lb. per sq. in.	Elongation in 2 in. per cent.		Reduction of area per cent.	
			Inverse Ratio	Not under	Inverse Ratio	Not under
Not over 8 in.	75 000	0.5 tens. str.	1 600 000 / tens str.	18	2 200 000 / tens str.	24
Over 8 to 12 in. inclusive	75 000	0.5 tens. str.	1 500 000 / tens str.	17	2 000 000 / tens. str.	22

ANNEALED

Not over 8 in.	80 000	0.5 tens. str.	1 800 000 / tens. str.	20	2 800 000 / tens. str.	32
Over 8 to 12 in., inclus.	80 000	0.5 tens. str.	1 725 000 / tens. str.	19	2 640 000 / tens. str.	30
Over 12 to 20 in., inclus.	80 000	0.5 tens. str.	1 650 000 / tens. str.	18	2 400 000 / tens. str.	28

(b) The classification by size of the forging shall be determined by the specified diameter or thickness which governs the size of the prolongation from which the test specimen is taken.

(c) The yield point shall be determined by the drop of the beam of the testing machine.

(d) Tests of forgings shall be made only after final treatment.

10. Tension Test Specimens.—(a) Tension test specimens shall be taken from a full-sized prolongation of any forging. For

forgings with large ends or collars the prolongation may be of the same cross section as that of the forging back of the large end or collar. Specimens may be taken from the forging itself with a hollow drill, if approved by the purchaser.

(b) The axis of the specimen shall be located at any point midway between the center and the surface of the forging, and shall be parallel to the axis of the forging in the direction in which the metal is most drawn out.

(c) Test specimens shall be of the form and dimensions shown in the former specification.

11. Number of Tests.—Unless otherwise specified by the purchaser, tests shall be made as follows:

(a) For unannealed forgings one tension test shall be made from each melt.

(b) For annealed forgings one tension test shall be made from each annealing charge. If more than one melt is represented in an annealing charge, one tension test shall be made from each melt.

(c) If more than one class of forgings by size is represented in any lot, one tension test from a forging of each class by size shall be made as specified in Sections 9 and 10.

(d) If any test specimen shows defective machining or develops flaws, it may be discarded and another substituted.

(e) If the percentage of elongation of any tension test specimen is less than that specified in Section 9 (a), and any part of

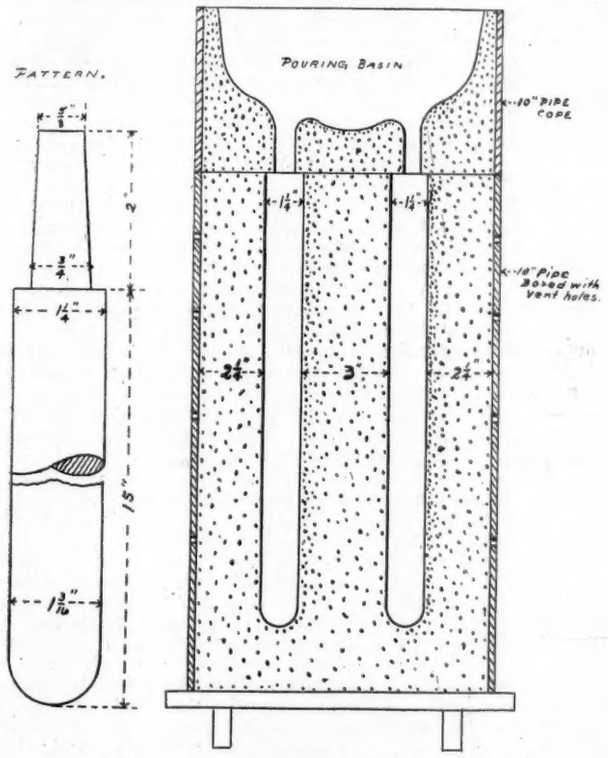


Fig. 1.—Mold for Arbitration Test Bar

the fracture is more than ¾ in. from the center of the gage length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

12. Retests.—(a) If the results of the physical tests of any test lot do not conform to the requirements specified, the manufacturer may reanneal such lot, but not more than three additional times unless authorized by the purchaser, and retests shall be made as specified in Section 11.

(b) When annealed forgings are specified, if the fracture of any tension test specimen shows over 15 per cent. crystalline, a second test shall be made. If the fracture of the second specimen shows over 15 per cent. crystalline, the forgings represented by such specimen shall be reannealed.

[NOTE:—Only the more important paragraphs of these specifications are printed here.—EDITOR].

APPENDIX C

SPECIFICATIONS FOR LOCOMOTIVE CYLINDER CASTINGS, CYLINDER BUSHINGS, CYLINDER HEADS, STEAM CHESTS, VALVE BUSHINGS AND PACKING RINGS

I. MANUFACTURE

1. Process.—Locomotive cylinders, cylinder bushings, cylinder heads, steam chests, valve bushings and packing rings shall be made from good quality close-grained gray iron cast in a dry mold.

II. CHEMICAL PROPERTIES AND TESTS

2. Chemical Composition.—Drillings taken from the fractured end of the transverse test bars shall conform to the following limits in chemical composition:

Phosphorus, not over	0.90 per cent
Sulphur, not over	0.12 per cent
Manganese, not over	0.70 per cent
Silicon for cylinders only, not over	1.60 per cent
Silicon for bushings, heads, chests and rings	1.50 to 1.80 per cent

3. Check Analysis.—A check analysis of drillings taken from the transverse test bar may be made by the purchaser, and shall conform to the requirements specified in Section 2.

III. PHYSICAL PROPERTIES AND TESTS

4. Transverse Tests.—When placed horizontally upon supports 12 in. apart and tested under a centrally applied load, the arbitration test bars, specified in Section 6 (a), shall show an average transverse strength of not less than 3200 lb. and an average deflection of not less than 0.09 in. The rate of application of the load shall be from 20 to 40 sec. for a deflection of 0.10 in.

5. Chill Test.—Before pouring, a sample of the iron shall be taken and chilled in a cast-iron mold, as specified in Section 6 (b). The sample shall be allowed to cool in the mold until it is dark red or almost black, when it may be knocked out and quenched in water. The sample, on being broken, must show a close-grained gray iron, with a well defined border of white iron at the bottom of the fracture. The depth of the white iron must not be less than 1-16 in. as measured at the center line.

6. Molds for Test Specimens.—(a) The mold for the arbitration bars is shown in Fig. 1. The bottom of the bar is 1-16 in.

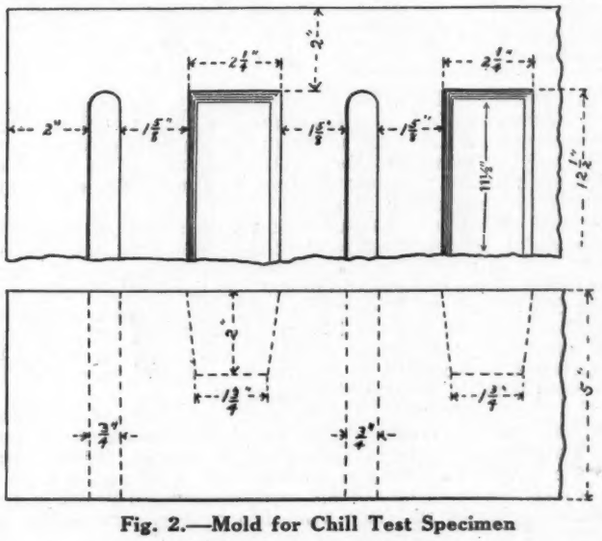


Fig. 2.—Mold for Chill Test Specimen

smaller in diameter than the top, to allow for draft and for the strain of pouring. The pattern shall not be rapped before withdrawing. The flask is to be rammed up with green molding sand, a little damper than usual, well mixed and put through a No. 8 sieve, with a mixture of 1 to 12 bituminous facing. The mold shall be rammed evenly and fairly hard, thoroughly dried and not cast until it is cold. The test bar should not be removed from the mold until cold enough to be handled. It shall not be rumbled or otherwise treated, being simply brushed off before testing.

(b) The form and dimensions of the mold for the chill test specimen shall be in accordance with Fig. 2.

7. Number of Tests.—(a) Two arbitration test bars, cast as specified in Section 6 (a), shall be poured from each ladle of metal used for one or more cylinders.

(b) One chill test, cast as specified in Section 6 (b), shall be poured from each ladle of metal used for one or more cylinders. The chill specimens may be cast in adjacent molds, but in such cases a space must be provided between the molds. (See Fig. 2.)

[NOTE:—Only the more important paragraphs of these specifications are shown here.—EDITOR].

APPENDIX D

SPECIFICATIONS FOR STEEL CASTINGS FOR LOCOMOTIVES

1. Basis of Purchase.—These specifications cover steel castings for locomotive frames, wheel centers and miscellaneous castings.

I. MANUFACTURE

2. Process.—The steel may be made by the open-hearth, crucible or other process approved by the purchaser.

3. Heat Treatment.—Castings shall be allowed to become cold.

They shall then be uniformly reheated to the proper temperature to refine the grain (a group thus reheated being known as an annealing charge) and allowed to cool uniformly and slowly. If, in the opinion of the purchaser or his representative, a casting is not properly annealed, he may at his option require the castings to be reannealed.

II. CHEMICAL PROPERTIES AND TESTS

4. Chemical Composition.—The steel shall conform to the following requirements as to chemical composition:

TABLE I

	Frames		Wheel Centers and Miscellaneous Castings
	Grade A	*Grade B	
Carbon .....0.25—0.37 per cent	0.37—0.50 per cent		0.22—0.35 per cent
Manganese ....0.40—0.75 per cent	0.40—0.75 per cent		0.40—0.75 per cent
Phosphorus, not over	0.05 per cent	0.05 per cent	0.05 per cent
Sulphur, not over	0.05 per cent	0.05 per cent	0.05 per cent

*When high carbon steel frames are specified this grade shall be used.

5. Ladle Analysis.—An analysis shall be made by the manufacturer from a test ingot taken during the pouring of each melt, a copy of which shall be given to the purchaser or his representative. This analysis shall conform to the requirements specified in Section 4.

6. Check Analysis.—Analysis may be made by the purchaser from a test piece and also from any casting selected at random, and shall conform to the requirements specified in Section 4.

III. PHYSICAL PROPERTIES AND TESTS

7. Tension Tests.—(a) The steel shall conform to the following minimum requirements as to tensile properties:

	Frames		Wheel Centers and Miscellaneous Castings
	Grade A	Grade B	
Tensile strength lb. per sq. in....	65 000	75 000	60 000
Elastic limit lb. per sq. in.....	30 000	35 000	25 000
Elongation in 2 in., min. per cent.	20	15	22
Reduction of area, min. per cent..	28	22	30

(b) The elastic limit shall be determined by an extensometer.

8. Alternative Tests to Destruction.—In the case of small or unimportant castings, a test to destruction on three castings from a lot may be substituted for the tension tests. This test shall show the material to be ductile, free from injurious defects and suitable for the purpose intended.

9. Test Specimen.—(a) Sufficient test bars shall be furnished from which test specimens required in Section 7 may be selected. They shall be attached to castings weighing 500 lb. or over, when the design of the castings will permit. If the castings weigh less than 500 lb., or are of such a design that test bars cannot be attached, two test bars shall be cast to represent each melt; or the quality of the casting shall be determined by testing to destruction as specified in Section 8. All test bars shall be annealed with the castings they represent.

(b) The manufacturer and the purchaser shall agree whether test bars can be attached to castings, on the location of the bars on the castings, on the castings to which bars are attached, and on the method of casting unattached bars.

(c) If the purchaser, or his representative, so desire, a test specimen may be cut from a finished casting, such casting so destroyed shall be paid for by the purchaser.

(d) The purchaser shall have the privilege of taking drillings for analysis from a casting, so long as it does not destroy or weaken the casting.

(e) Tension test specimens shall be of the form and dimension shown in the previous specifications. Annealing coupons shall be located at points agreed upon by the manufacturer and the purchaser.

10. Number of Tests.—One tension test shall be made from each locomotive frame, and in the case of wheel centers and miscellaneous castings, from an annealing charge, or from each melt if more than one melt is in an annealing charge.

IV. VARIATION IN WEIGHT

11. Weight.—All castings shall come within the maximum and minimum weight, where shown on the prints, and when castings weighing more than the allowable maximum weight are presented, such castings shall be accepted at the maximum weight provided they meet all other tests, the excess weight being at the expense of the manufacturer.

[NOTE:—Only the more important paragraphs of these specifications are printed here.—EDITOR].

DISCUSSION

C. D. Young (Penna. Lines): The committee in rendering the report incorporates the original silicon requirement for bushings, heads, chests and rings. With the increasing use of super-heated steam, it is becoming very desirable to have a close grained hard iron for this purpose and I believe the time has arrived when we should reduce the silicon requirement to make it agree with the silicon mixture requirement. I move that the bushings, heads, chests and rings have the same silicon requirement as that which is specified for cylinders, namely, 1.60 per cent.

(The motion to accept the report of the committee as amended, was put to vote and carried.)

SAFETY APPLIANCES

M. K. Barnum (B. & O.): The committee has only a verbal report to make. The committee met with the special committee on Relation of Railway Operation to Legislation and the subject was discussed at some length, but it was not thought necessary to make any written report, in view of the fact that the time limit expired several years ago for the full equipment of locomotives with the safety appliances which had been prescribed. The committee would therefore respectfully recommend that it be discharged.

(The report of the committee was accepted and the committee discharged.)

COMPOUNDING SUPERHEATER LOCOMOTIVES

Lawford H. Fry, (Baldwin Loco. Works): The conclusions which I wish to offer for discussion this morning are, first, the fact that compound cylinders applied to a single expansion locomotive will show a saving in fuel and water of from 15 to 25 per cent, whether saturated or superheated steam be used. I wish further to show that in securing the saving some additional complication is introduced, and the question as to whether compounding is practically worth while or not can only be answered after studying the local conditions in each case. Take first the process by which compounding effects a saving in steam consumption. If any given range of expansion be divided between two cylinders instead of being carried out in one, the same amount of work can be obtained with a smaller consumption of steam. This is due to the fact that the range in temperature in the steam coming in contact with any one portion of the cylinder will be reduced, and consequently the thermal losses, in initial condensation, will be less. In addition to this, compounding offers a further opportunity for economy, by making it feasible to use a higher ratio of expansion than can be efficiently done with a single expansion engine.

In a single expansion locomotive it will be found that the greatest economy is obtained with a cut-off at about 30 per cent of the stroke and that with a shorter cut-off in spite of the theoretical advantage of a higher expansion the practical result will be a decrease in efficiency. Take for example, the K-29 superheater, Pacific type locomotive of the Pennsylvania Railroad, tests of which are described in the Company's Bulletin No. 19. The diagram on page 98 of this Bulletin shows that while the rate per indicated horse-power-hour was 18 lb. for cut-offs between 30 per cent and 35 per cent, it grows to 20 lb. when the cut-off was shortened to 25 per cent. This is largely due to the action of the valve gear, which, if it is to be adapted to all the requirements of locomotive service, cannot operate economically at very short cut-offs. To quote from the Bulletin referred to above—"The ideal conditions in regard to the expansion of steam in the cylinder would be to admit steam up to the cut-off point and then expand it to the atmospheric pressure before release. With the necessity for draft on the fire and the practical limitations of valve gears this is not possible and the steam must be discharged at a comparatively high pressure." The Bulletin then gives figures showing that the number of expansions (that is the volume of steam at release divided by the volume at cut-off) is 1.37 for a cut-off of 45 per cent, 1.75 for a cut-off at 30 per cent, and 2.0 for a cut-off at 25 per cent. This means that at the most economical cut-off of 30 per cent, the steam is being released at a pressure of about 51 lb. per sq. in. As this steam may carry some superheat, or at least is perfectly dry, there would obviously be considerable advantage in expanding it further. The use of compound cylinders will enable the effective ratio of expansion to be practically doubled.

It should be noted that it is not only the limitations of the valve motion which prevent a high ratio of expansion in a single cylinder on a locomotive. If the valves were modified so as to make efficient the use of a high expansion in a single cylinder, there would still be a mechanical advantage in dividing the expansion into two cylinders so as to produce a more uniform cylinder tractive force. With a high ratio of expansion in a single cylinder there will be a wide difference between the initial and the final pressures, and consequently a considerable difference between the tractive force during admission and the mean tractive force average throughout the stroke. Therefore, if the cylinders be made large enough to allow the mean tractive force to utilize a proper proportion of the weight on drivers, there will be a danger of slipping during the time of maximum cylinder pressure while steam is being admitted. By dividing the expansion, the difference between

maximum and minimum pressure in each cylinder is reduced, and with the cylinders quartered a more uniform tractive force is obtained. Practically all of the foregoing applies equally whether the locomotive uses saturated or superheated steam, but the last point is of special importance in connection with superheated steam, since with this medium there is more to be gained by a high ratio of expansion. In fact, if the expansion is insufficient the steam when exhausted will still be superheated, a condition which represents avoidable waste. Having stated briefly the reasons for expecting economy in steam consumption with compound cylinders, let us now see what results are being obtained in practice. In Europe there is a growing tendency to use compound cylinders with superheated steam, and all reports show that the results are satisfactory.

In France five of the six principal railways have adopted four-cylinder compound superheater engines as standards for both freight and passenger service, and after comparative trials are abandoning the single expansion cylinders. A paper by Mr. Sauvage before the English Institution of Mechanical Engineers reports that the Paris-Lyons and Mediterranean Railway in tests of Pacific type engines in service found that the single expansion consumed from 19 to 21.5 lb. of water per 1 h. p. per hour, and the compound from 13.5 to 15.0 lb., a saving of nearly 30 per cent.

In Germany, during the past three years compound cylinders have been reintroduced for the latest high speed passenger engines of the 4-6-0 type, and are reported as giving satisfactory results. Comparative tests have shown a water consumption per horse power hour of 23.8 lb. for the single expansion and 18 lb. for the compound, approximately 25 per cent saving.

In England the majority of superheater engines have single expansion cylinders, but some of the railroads are trying compounding, and Mr. Fowler of the Midland Railway, in a paper read before the Institution of Civil Engineers, last year, gave some results of comparative tests between four engines, all similar except for the quality of steam used and the number of cylinders. Two of the engines were two-cylinder single expansion, one using saturated and one superheated steam, while the other two were three-cylinder compounds, one was saturated, the others with superheated steam. Taking the performance of single-expansion saturated steam locomotive as a basis of comparison, the following savings in coal were observed: Compounding alone, 15 per cent; superheating alone, 25 per cent; compounding and superheating, 37.5 per cent.

Having seen the evidence that the saving can be obtained, let us consider the difficulties to be overcome in order to secure it. In the first place there will be a slight increase in first cost, and an increase in weight of 2 or 3 per cent, the latter being offset, however, by the better balance to be obtained with 3 or 4 cylinders. There will be more pistons, rods, valves, etc., requiring increased attention and maintenance, but the division of power between more than two cylinders may prove advantageous by reducing the power to be transmitted by each rod. In addition to this multiplication of parts the designer must provide for a crank axle and must find space for the large low pressure cylinders. These problems have been solved in European practice; and although the difficulty is increased by the size of the locomotives in this country, their solution should not be beyond the power of our American designers.

There is one further point of importance to be considered if a compound is to run at anything more than a slow speed, and that is the question of back pressure, the larger area of the low pressure cylinder makes the engine more susceptible to the evil effects of back pressure. In order that the engine may work successfully and efficiently at high speed the blast pipe must operate with the lowest possible pressure and the exhaust passage be designed to offer the least possible resistance to the steam.

With expensive fuel and ample opportunities for supervision and maintenance, the conditions will favor compounding, but whether the saving is practically worth while or not will depend on local conditions.

George R. Henderson, (Baldwin Loco. Works): We all know the principal gain in compounding is by eliminating cylinder condensation. We also know that the superheater gets its main value in reducing or doing away with the cylinder condensation, and if we do away with the condensation by one means, it hardly looks reasonable that we can expect still to get the same amount of economy by trying to do away with it a second time. It would be very easy to make a compound locomotive more economical by the use of superheated steam, more so than to make a superheater locomotive more economical by compounding. What I mean is that a certain temperature, up to 200 or 250 degrees of superheat will prevent any condensation in the simple cylinder up to probably one-fifth cut-off, or five expansions normally. Now, if we go ahead and increase our superheat still greater, we increase the volume of our steam, it just happens that we get about the same ratio of increased work. If we go so far as to have superheated steam at the moment of exhaust, we have so enlarged our volume per pound of steam or water, that we cannot go on with the increasing amount of superheat and get a corresponding amount of economy. These things look to the fact that it is necessary in the tests mentioned by Mr. Fry to know whether in all cases the amount of superheat, that is the temperature of the steam, was the same, and whether all the conditions were strictly comparable.

Mr. Fry: I have very complete data on the English tests here, and so far as I can see they were as nearly comparable as possible. In regard to the point Mr. Henderson made about the opportunity for saving being less because the initial condensation is done away with, I think the superheater makes a saving at the other end of the stroke. With the single expansion engine the compounding cuts down the initial condensation. With the superheater engine it tends to save the steam you would throw away dry or slightly superheated. With the single expansion superheater, you do not get much initial condensation, but you have to throw away good dry steam at a fairly high pressure, but if you put another cylinder on behind that you can make that steam still do some work.

C. D. Young (Penn.): I think the conclusions Mr. Fry has drawn are quite correct, except that I would like to add that there hardly seems the possibility in this country, with our operating conditions, that we will go to compounding to any great extent on high speed engines. High speed carries with it a fairly high maintenance of the parts, which, as you all know, is rather difficult to obtain. Whether compounding or superheating would give you as fast an engine, with equivalent draw-bar pull, as the simple superheater engine, I much question. Even though you may have superheated steam with the compounding, you still have the problem of getting rid of a large quantity of steam from the low pressure cylinder, and also of obtaining a sufficient amount of steam to supply the high pressure cylinder, in comparison with the amount you must furnish to the low pressure cylinder. It seems to me for American practice, it is a question whether we will use compounding, for passenger work particularly. The requirements of slow speed lend themselves to compounding, and it is the ideal thing to have.

I believe if we could provide a valve design that would withstand a temperature of 800 deg. F., and you could obtain superheat in that vicinity, you would then get a proportional increase that would warrant a higher superheat than we are getting today with the average modern locomotive. I believe if that matter is to be met, so far as economy is concerned, it will have to be met in that direction. We are getting experience every year in the maintenance of parts subject to high superheat, and our experience in that direction should lead to the development of an efficient valve, different from the piston type of valve, perhaps a pocket type of valve, made of material which will withstand high superheat.

Prof. L. E. Endsley (Pittsburgh University): I think Mr. Young's point regarding the increasing of the superheat is important. We must, however, take care of the lubrication and some other things, and if we can do that, the gain of the last 100 degrees is going to be more than the gain of the first 100 degrees of superheat. In tests from 80 degrees to 240 degrees superheat, making three steps—80, 160 and 240, at three different temperatures—the last 80 deg. is worth three times as much as the first 80 deg. If I could go to 320 deg. the last 80 deg. would be worth considerably more.

I do not think we will get much advantage through compounding our American locomotives, if we get a large enough cylinder in the simple engine. All we want to do is to reduce pressure in our steam down to the point where it will get enough draft to steam the locomotive, and if you put on a compound cylinder and reduce it too low, to make the engine steam, you will not get the increased power we are getting today, by reason of the superheat. I think it is important that we get something to carry a higher degree of superheat, and then we will not have to go to the compounding and add to our troubles by the employment of a double set of cylinders and other things.

William Flynn (M. C.): We have 90 compound engines on our division, and at the present time we have about 12 of these engines equipped with superheaters. The results have so pleased the mechanical department, as well as the operating department, that I think I am safe in saying that we will apply superheaters to the balance of those locomotives. On the division where we conducted one of our most important tests we found we could increase the tonnage of the superheater compound over the saturated compound 15 per cent. That seems an astonishing figure, but it is true; and the superheater compound would

handle that increased tonnage more satisfactorily than a saturated compound would do it, and not burn quite as much coal. These are used in slow speed freight service. We had occasion to put one of these superheater compounds on a passenger train, and we found the engine would run about 10 or 12 miles faster than an engine of the same class without the superheater-compound arrangement.

Mr. Henderson: There is a difference between superheating compounds and compounding superheaters. With Mallet locomotives, for instance, there is a great advantage in the compounding feature, one being that the flexible pipes carry steam of moderate pressure, about 100 lb. The superheater is a great advantage there, because there is certainly some loss in temperature in passing through the receiving pipe, and you can put in a superheater in that engine, to make up for cylinder expansion and also loss of temperature in your pipe, and there is no question in such an engine it is a great advantage to have low pressure in the flexible pipes. I feel that if we need a little more economy, we had better get a little more superheat. The problem of superheating compounds is more logical than that of compounding superheaters.

Mr. Fry: Before compounding superheater locomotives over here we must weigh very carefully the disadvantages of the increased complication, and as a general proposition I doubt very much if it will be widely adopted in this country.

SMOKE PREVENTION

[The committee report on this subject covered very thoroughly the system employed by the railways in Chicago in handling the smoke problem. This system has been quite thoroughly described in these columns and special attention is called to the abstract of the paper on Smoke Prevention presented before the International Railway Fuel Association, published in the *Railway Age Gazette* of May 21, 1915, and the *Railway Age Gazette, Mechanical Edition* for June.—Editor.]

DISCUSSION

M. D. Franey (N. Y. C.): Speaking for the Fourth District of the New York Central Lines, we have a smoke washing device at our Englewood engine house. We handle approximately from 80 to 100 locomotives at that point each 24 hours. The smoke washing device consists of a 78-in. steel blade fan, motor driven. The house is piped with a conduit or duct extending over the portion of the house that is usually occupied by the smoke jackets. Connecting each pit with this smoke jacket is an adjustable telescope jack that fits down with a funnel over the smoke stack of the locomotive. The smoke is drawn up by means of the fan through the jacks and ducts and delivered at high velocity into vats of heated water, heated by steam. The action is such that it produces a wave motion and envelops the smoke and gases several times as they pass out through baffles and finally disappear through the stack. The solids, carbons, etc., are gathered on the top of the water in the form of a foam. The other gases pass out with steam whiteness from the top of the stack, and as they disappear it is very evident that the carbon is taken from the smoke. We obtain from eight to ten barrels of carbon out of the smoke,—this is pure carbon—and the whole plant is working very satisfactorily.

We have this disadvantage, that the acids produced are very injurious to the metals, and it even will eat out the concrete of which the duct or vat is composed. We have found it necessary in making the ducts, to make them of transite—that is the best product we have obtained so far. I am not prepared at this time to give you official figures, but from tests we have made, unofficial tests, the figures seem to be satisfactory and show a saving in fuel on engines stored in the engine house.

L. R. Pomeroy: Is there any salvage from the by-products of these plants?

Mr. Franey: We have deposited considerable of the carbon, but I am not prepared to say to just what extent it has been made a paying proposition.

Wm. Elmer, Jr., (Penna. Lines): I can say a word about Buffalo. The city council has endeavored for a year or more to agree on some ordinance, which would be acceptable to the manufacturing industries and to the railroads, regarding smoke prevention. Without an ordinance the railroads have done a good deal toward reducing the amount of smoke which the engines are making. All the railroads are alive to the situation and making every possible effort to prevent the making of very dense smoke, so as to forestall any drastic efforts of the part of the Council.

E. W. Pratt: I do not think there is anything special to say except to urge on those who have not had to go through the experience we have gone through, to cut down the smoke nuisance as much as they can before the authorities take action. If we had done that in Chicago we would not now be up against the expensive problem of electrification. The final report on that matter has not yet been made public but will cost approximately $192,000,000 for the cost of the electrification, and another $100,000,000, or $200,000,000, for incidental betterments due to changes in motive power. We will have to do some business to provide the interest on that $300,000,000.

ADDITIONAL MASTER MECHANICS' REGISTRATION

Andrus, C. H., M. M.; P. R. R.
Anthony, F. S., Alamac.
Appler, A. B., M. E.; D. & H., Blenheim.
Arp, W. C., S. M. P.; Vandalia, Blenheim.
Baker, Geo. H., Prest., Railway Eden. Assoc.; Dennis.
Barnum, M. K., S. M. P.; B. & O.; Dennis.
Barrett, C. D., A. E. M. P.; P. R. R.; Brighton.
Barton, T. F., M. M.; D., L. & W.; Traymore.
Basford, Geo. M., Jos. T. Ryerson & Son; Blenheim.
Bawden, Wm., M. M.; Term. R. R. Asso. of St. L.; Brighton.
Bennett, W. H., M. M.; P. R. R.; Traymore.
Black, W. G.; M. M.; N. Y. C.; Chester Inn.
Booth, J. K., Gen. For.; B. & L. E.; Traymore.
Bowers, O., M. M.; T. & O. C.; Chalfonte.
Brangs, P. H., Dennis.
Brennan, E. J., M. M.; B. R. & P.; Arlington.
Brewer, J. W., M. M.; C. & A.; Alamac.
Brown, H. M., S. S.; C. & O.; Blenheim.
Brown, M. G., S. M. P.; G. & S. I.; Haddon Hall.
Butler, W. S., M. M.; C. & O.; Blenheim.
Carey, J. J., M. M.; T. & P.; Traymore.
Carroll, J. T., A. G. S. M. P.; B. & O.; Blenheim.
Carroll, W. P., M. M.; N. Y. C.; Dennis.
Cassady, J. A.; M. M.; Q. & C.; Traymore.
Chambers, C. E., S. M. P.; C. of N. J. R. R.; Dennis.
Clark, F. H., G. S. M. P.; B. & O.; Blenheim.
Combs, W. B., M. M.; M. D. & Sav.; Arlington.
Conners, Jas. J., A. S. M. P., C. M. & St. P.; Alamac.
Crandall, W. J., M. M.; N. Y. C.; Dennis.
Cross, C. W.; Equipment Imp. Co.; Traymore.
Darlow, A. M., S. M. P.; Buff. & Susq.; Chalfonte.
Davis, J. H., Elec. Engr., B. & O.; Shelburne.
Dawson, L. L., S. M. P.; F. W. & D. C.; Brighton.
Deaner, Chas. F., M. M.; N. Y. C.; Monticello.
Deeter, D. H., M. M.; P. & R.
Diehr, C. P., M. M.; N. Y. C.
Duffey, G. J., M. M.; L. E. & W.; Traymore.
Dunham, W. E., Suprv. M. P.; C. & N. W.; Blenheim.
Elmer, Wm., S. M. P.; P. R. R.; Brighton.
Elmes, E. E., A. E. M. P.; P. & R.; Blenheim.
Emerson, G. H., Gen. Mgr., Gt. No.; She'burne.
Ettinger, R L., C. M. E.; Southern; Dennis.
Ferguson, L. B., M. M.; V. S. & P.; Monticello.
Flanagan, M., M. M.; C. & O.; Blenheim.
Flavin, J. T., M. M.; N. Y. C.; Blenheim.
Flory, B. P., S. M. P.; N. Y. O. & W.; Blenheim.
Fogg, J. W., Boss Lock Nut Co.; Chalfonte.
Fowler, Geo. L., Conslt. Engr.; Dennis.
Franey, M. D., M. M.; N. Y. C.; Blenheim.
Frice, A. J., A. S. M. P.; N. Y. C.; Chalfonte.
Fuller, C. E., S. M. P. & M.; U. P.; Blenheim.
Gaines, F. F., S. M. P.; C. of Ga.; Blenheim.
Gallagher, G. A., M. M.; Ill. So.; Chalfonte.
Galloway, A. K., M. M.; B. & O., Dennis.
Gaspar, Chas. L., Sales Mgr.; National Mall. Cast. Co.; Traymore.
Gibbs, J. W., M. M.; Southern; Arlington.
Gillespie, H. C.; M. M.; C. & O.; Blenheim.
Gilmour, Geo., Supt. Insp.; Travelers Ins. Co.; Haddon Hall.
Goodrich, H., M. M.; N. Y. C.; New Holland.
Goodwin, G. S., M. E.; Rock Island.
Gould, J. R., S. M. P.; C. & O.; Shelburne.
Greenwood, H. F., S. S.; N. & W.; Traymore.
Griffith, W. S., M. M.; P. M.; Strand.
Haig, M. H., M. E.; A., T. & S. F.; Traymore.
Hamilton, Tabor, M. M.; Cumb. Val.; Brighton.
Harris, C. M., M. M.; Wash. Term.; Traymore.
Harris, H. Y., M. M.; Tampa & G. C.; Westminster.
Hartman, W. J., A. B. Instr.; Rock Island; Edison.
Hassett, M. W., M. M.; N. Y. C.; Chalfonte.
Haug, Harry, M. M.; Brown. & Mid.; Lexington.
Henry, W. C. A., S. M. P.; Penna. Lines; Chelsea.
Highleyman, J. W., M. M.; U. P.; Schiltz.
Hill, J. F., M. M.; W. & L. E.; Blenheim.

Hill, W. H., M. M.; Cornwall R. R.; Lexington.
Hunter, H. S., M. M.; P. & R.; Devonshire.
Jaynes, R. T., M. M.; L. & H. R.; Traymore.
Jones, L. B., A. E. M. P.; Penna. Lines; Traymore.
Kantmann, A. G., Chalfonte.
Kearney, Alexander, A. S. M. P.; N. & W.; Traymore.
Keiser, C. B., M. M.; P. R. R.; Strand.
Kellogg, W. L., S. M. P.; M. K. & T.; Haddon Hall.
Kelly, J. P., C. A. B. E.; N. Y. C.; Chalfonte.
Kendrich, J. P., M. M.; B. R. & P.; Lexington.
Kiesel, W. F., A. M. E.; P. R. R.; Chelsea.
Kinney, W. H., Strand.
Knight, H. R., M. M.; West. Mary.; Monticello.
Kuhn, W. T., S. M. P.; T. H. & B.; Traymore.
Ladley, Walter E., S. M. P.; Reid Newfound. Co.; Blenheim.
Lillie, Grant W., Mech. Supt.; Rock Island; Cheltenham.
Little, J. C., M. E.; C. & N. W.; Traymore.
Lovell, Alfred, Conslt. Engr.; Traymore.
McAmis, W. H., M. M.; Charlotte, Har. & No.
McFarland, Prof. H. B., Engr. Tests; A. T. & S. F.; Chalfonte.
McGoff, J. H., M. S.; Mech. Supt.; A. T. & S. F.; Traymore.
McGuire, J. J., M. M.; B. & O.; Chalfonte.
McNulty, F. M., S. M. P. & R. S.; Mon. Con.; Chalfonte.
McRae, J. A., M. E.; Chalfonte.
Machesney, A. G., Detroit Lubricator Co.; Lexington.
Mackenzie, John, Johnson Wrecking Frog Co.; Louvan.
Maher, P., Blenheim.
Manchester, A. E., S. M. P.; C. M. & St. P.; Traymore.
Manning, J. H., S. M. P.; D. & H.; Marlborough-Blenheim.
Mannion, T. D., M. M.; Atlantic City Ry.
Marriott, J. F., C. D.; C. & O.; Shelburne.
Mauk, E. L., M. M.; G. F. & A.; Continental.
Maver, A. A., M. M.; Grand Trunk; Traymore.
Maxfield, H. H., M. M.; P. R. R.; Brighton.
May, H. C., S. M. P.; C. I. & L.; Chalfonte.
Meister, C. L.; M. E.; A. C. L.; Dennis.
Miller, Geo. A., S. M. P.; Fla. East Coast; Sterling.
Miller, J. B., S. L. & S. F.; Sommerset.
Miller, S. W., Rochester Welding Works; Haddon Hall.
Miller, W. J., S. M. P.; S. L. S. W.; Traymore.
Minshull, P. H., M. M.; N. Y. O. & W.; Traymore.
Moll, George, M. M.; P. & R.; Sterling.
Monfee, A. J., M. M.; Birmingh. So.; Dunlop.
Murray, E. A., M. M.; C. & O.; Blenheim.
O'Brien, Wm. J., M. M.; K. & M.; Haddon Hall.
Painter, J. H., Supt. Shops; A. C. L.; Chalfonte.
Parsons, J. G., Supt. Shops; N. Y. C.; Chalfonte.
Patterson, Robt., M. M.; Grand Trunk; Blenheim.
Pearce, J. S., M. M.; N. & W.; Chelsea.
Perine, U. M., S. M. P.; P. R. R.; Traymore.
Perrine, W. M., M. M.; C. of N. J.; Pennhurst.
Pfahler, F. P., Insp. I. C. C.; Arlington.
Pilcher, John A., M. E.; N. & W.; Dennis.
Pomeroy, L. R.; U. S. L. & H. Co.; Blenheim.
Porter, Chas. D., A. E. M. P.; P. R. R.; Brighton.
Potts, C. H., M. M.; P. R. R.; Chalfonte.
Purcell, J., A. V. P.; Asst. to V. P.; A. T. & S. F.; Blenheim.
Ramage, J. C., Supt. Tests; Southern; Brighton.
Rauch, H. S., Gen. For.; N. Y. C.
Raymond, P. L., M. P. Insp.; P. & R.
Redding. D. J., A. S. M. P.; P. & L. E.; Traymore.
Reynolds, O. H., Wm. Jessup & Sons; Dennis.
Rhodes, L. B., S. M.; Stand. Heat & Vent. Co.; Chalfonte.
Richardson, L. A., Mech. Supt.; Rock Island; Traymore.
Ricketson, W. E., M. E.; Big Four, Blenheim.
Rink, Geo. W., M. M.; C. of N. J.; Traymore.
Ripley, C. T., Gen. Mech. Insp.; A. T. & S. F.; Blenheim.
Robinson, M., M. M.; C. C. & S. F.; Traymore.
Rosing, M. H. V., Spec. Engr.; S. L. & S. F.; Traymore.
Rusling, W. J., A. E. H. P.; P. B. & W.; Brighton.
Scanland, N. B., M. M.; Mary. & Pa.; Arlington.
Schlafge, Wm., G. M. S.; Erie; Blenheim.
Seley, C. A., Chalfonte.
Sheafe, J. S., M. M.; S. I. R. T.
Sheahan, J. F., S. M. P.; A. B. & A.; Chalfonte.
Shelby, C. K., M. M.; P. R. R.; Chelsea.
Shepard, L. A., Scullin-Galagher Iron & Steel Co.; Brighton.
Sinclair, Angus, Editor; Locomotive Engineering; Chalfonte.
Slayton, C. E., M. M.; St. J. & G. I.; Arlington.
Smith, J. L., M. M.; P. S. & H.; Monticello.
Smith, M R., M. M.; C. I. & L.; Haddon Hall.
Smith, Willard A., Prest., The Railway Review; Traymore.
Snell, E. J., M. M.; N. Y. C.; Lexington.
Stewart, R. L., M. S.; Mech. Supt.; Rock Island; Chelsea.
Stocks, W. H., Alamac.
Stockton, Jas., M. M.; New O. Term.; Arlington.
Stranahan, J. H., M. M.; D. & H.; Chalfonte.
Streeter, L. B., A. B. E.; I. C.; Chalfonte.
Stubbs, G. W., M. M.; Ocilla So.; Arlington.
Stubbs, F. W., M. E.; C. G. W.
Sullivan, J. J., S. M. P.; N. C. & St. L.; Traymore.
Sweeley, E. H., Gen. For. Loco. Rep.; L. I.; Chalfonte.
Symons, W. E., Conslt. Engr.; L. E.; Chalfonte.
Terrell, C. H., Asst. S. M. P.; C. & O.; Haddon Hall.
Thomson, S. G., S. M. P.; P. & R.; Lennox Apt.
Tierney, H. J., M. E.; M. K. & T.; Traymore.
Todd, Louis C., M. M.; B. & M.; Alamac.
Tollerton, W. J., Mech. Supt.; Rock Island; Blenheim.
Van Doren, G. L., S. S.; C. of N. J; Dennis.
Wahlen, John, M. M.; Barre & Chelsea; Arlington.
Wallis, J. T., G. S. M. P.; P. R. R.; Chelsea.
Walsh, F. O., S. M. P.; Ga.; Strand.
Wanamaker, H., S. S.; N. Y. C.; Traymore.
Warthen, J. O., M. M.; Danv. & West.; Westminster.
Waters, J. J., S. M. P.; P. M.; Blenheim.
Watkins, G. H., A. E. M. P.; P. R. R.; Blenheim.
Watkins, W. H., M. M.; I. C.; Arlington.
Whyte, F. H.; Hutchins Car Roofing Co.; Blenheim.
Wieseckel, G. F., M. M.; West. Mary.; Dennis.
Williams, W. H., M. M.; B. R. & P.; Alamac.
Woods, J. E., Gen. For.; B. & O.
Wright, O. C., A. E. M. P.; Penn. Lines; Blenheim.
Wyman, R. L., M. M.; L. & N.; Pennhurst.
Young, C. B., M. E.; C. B. & Q.; Traymore.
Young, C. D., Engr. Tests; P. R. R.; Brighton.

ADDITIONAL MASTER CAR BUILDERS' REGISTRATION

Alquist, Peter, S. C. D.; M. K. & T.; Haddon Hall.
Appler, A. B., M. E.; D. & H.; Blenheim.
Arp, W. C., S. M. P.; Vandalia; Blenheim.
Barnum, M. K., S. M. P.; B. & O.; Dennis.
Barrett, C. D., A. E. M. P.; P. R. R.; Brighton.
Bawden, Wm., M. M.; Term. R. R. A. of St. L.; Brighton.
Bosworth, W. M., M. E.; L. & N.
Boutet, H., Ch. Joint Insp.; Chalfonte.
Bowersox, C., M. M.; E. & O. C.; Chalfonte.
Brown, M. G., S. M. P.; G. & S. I.; Haddon Hall.
Chambers, C. E., S. M. P.; C. of N. J.; Dennis.
Clark, F. H., G. S. M. P.; B. & O.; Blenheim.
Darlow, A. M., S. M. P.; Buff. & Susq.; Chalfonte.
Dawson, L. L., S. M. P.; Ft. W. & D. C.; Brighton.
Deeter, D. H., G. M. M.; P. & R.
Duffey, G. J., M. M.; L. E. & W.; Traymore.
Dunham, W. E., S. M. P. & M.; C. & N. W.; Blenheim.
Elmer, Wm., S. M. P.; P. R. R.; Brighton.
Emerson, G. H., Gen. Mgr. G. N.; Shelburne.
Elmes, C. C., A. E. M. P.; P. & R.; Blenheim.
Ettinger, R. L., C. M. E.; Southern, Dennis.
Flory, B. P., S. M. P.; N. Y. O. & W.; Blenheim.
Fowler, Geo. L., Consult. Engr.; Dennis.
Fuller, C E., S. M. P. & M.; U. P.; Blenheim.
Gaines, F. F., S. M. P.; C. of Ga., Blenheim.
Gallagher, G. A., M. M.; Ill. So.; Chalfonte.
Gaskill, C. S., A. E. M. P.; P. B. & W.
Goodrich, M, M. M.; N. Y. C.; New Holland.
Gould, J. R., S. M. P.; C. & O.; Shelburne.
Grives, E. W., Blenheim.
Hamilton, Tabor, M. M.; Cumb. Val.; Brighton.
Harris, C. M., M. M.; Wash. Term.; Traymore.
Harris, H. Y., M. M.; Tampa & G. C.; Westminster.
Hartman, W J., A. B. Instr.; Rock Island; Edison.
Henry, W. C. A., S. M. P.; Penna. Lines; Chelsea.
Herrold, A. E., M. C. B.; Mon. Con.; Chalfonte.
Jaynes, R. T., M. M.; L. & H.; Traymore.
Jones, L. B., A. E. M. P.; Penna. Lines; Traymore.
Kearney, A., A. S. M. P.; N. & W.; Traymore.
Kellogg, W. L., S. M. P.; M. K. & T.; Haddon Hall.
Kelly, J. P., C. A. B. E.; N. Y. C.; Chalfonte.
Kiesel, W. F., A. M. E.; P. R. R.; Chelsea.
Kleine, R. L., Ch. Car Insp.; P. R. R.; Dennis.
Kuhn, W. T., S. M. P.; T. H. & B.; Traymore.
La Mar, A., M. M.;P. R. R.; Shelburne.
Laughlin, G. F., Gen. Supt.; Armour Car Lines; Blenheim.
Lillie, G. W., Mech. Supt.; Rock Island; Cheltenham.
Lovell, Alfred, Consult. Engr.; Traymore.
McAnnis, W. H., M. M.; C. H. & N.
McFarland, H. B., Engr. Tests, A. T. & S. F.; Chalfonte.
Manchester, A. E., S. M. P.; C. M. & St. P.; Traymore
Manning, J. H., S. M. P.; D. & H.; Blenheim.
Maxfield, H. M., M. M.; P. R. R.; Brighton.
May, H. C., S. M. P.; C. I. & L.; Chalfonte.
Meister, C L., M. E.; A. C. L.; Dennis.
Miller, G. A., S. M. P.; Fla. East Coast; Sterling.
Miller, W. J., S. M. P.; St. L. S. W.; Traymore.
Monfee, A. J., M. M.; Birmh. So.; Dunlap.

O'Brien, W. J., M. M.; K. & M.; Haddon Hall.
Painter, J. H., Supt. Shops; A. C. L.; Chalfonte.
Perine, D. M., S. M. P.; P. R. R.; Traymore.
Pfahler, F. P., Insp. I. C. C.; Arlington.
Pilcher, John A., M. E.; N. & W.; Dennis.
Porter, C. D., A. E. M. P.; P. R. R.; Brighton.
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Highleyman, M. R., Schlitz.
Holzemer, J. F., Pur. Agt.; T. & O. C.; Haddon Hall.
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VanBrunt, G. E., M. M.; P. R. R.; Schiltz.
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Wilson, H., Fla. East Coast; Sterling.
Wilson, Kirven, Fla. East Coast; Sterling.
Woodworth, C. B., Super. Shop Practice; B. & O.; Traymore.

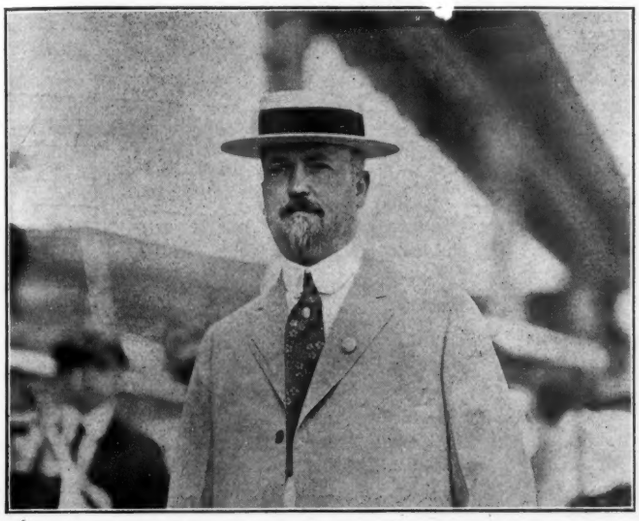
LITTLE INTERVIEWS

The expert on car wheels leaned back and remarked, "Some of the desirable features of a car wheel are inadvertent, as you may say. Do you see that street car wheel? The holes in the body of the wheel are extremely useful, but they do not in any degree serve the purpose for which they were first introduced. Originally the street car wheel was cast with spokes. As equipment became heavier the wheel was cast solid. The solid wheel was objectionable; in cities there was complaint that it rang. These holes it was hoped would deaden that ringing. Now, in my opinion, the wheels continue to ring just the same, but the holes in the wheel are retained since they are so convenient to hook chains into to drag the car and truck around when a wheel is broken."

Conventionalities

Burton W. Mudge came to the conventions alone this year. Burton, Jr., was in school, it was not desired to take him out, and Mrs. Mudge decided to stay at home with it.

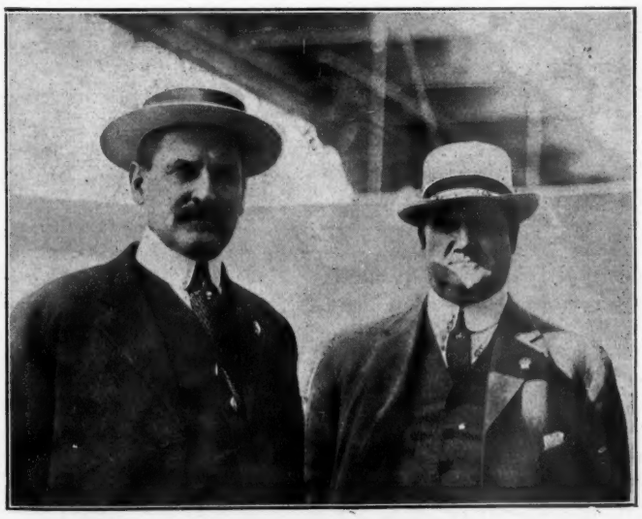
L. A. Richardson, mechanical superintendent first district, Chicago, Rock Island & Pacific, Des Moines, Iowa, who arrived



B. P. Flory, Superintendent Motive Power, New York, Ontario & Western

on the Chicago special Tuesday, is accompanied by his daughter, Miss Dorothy. They are stopping at the Traymore.

John P. Landreth, of the Garlock Packing Company, is accompanied this year by Mrs. Landreth and little daughter. The fact that the little girl is familiarly known as "Ginger"



Hugh Montgomery of the Bangor and Aroostook, and George Wildin of the New Haven

indicates correctly that she has certain of the qualities of her energetic father.

F. W. Brazier, superintendent of rolling stock of the New York Central, is down a little early this year in order to get rested up in time to get in his usual hard work at the M. C. B. Association next week. He has been a little bit "under the weather" lately.

The Q. & C. Company has unintentionally been exalted by the "printer's devil." In the list of exhibitors yesterday it was shown as the O. & C., and for a little while, not being able to find the name, friends of the company were afraid that their exhibit had not arrived safely.

President Gaines of the M. M. Association has been ill for the past two or three weeks and has not yet fully recovered his strength. He found it necessary to have Secretary Taylor read his address yesterday morning, but was able to preside over the remainder of the session.

Friends of W. L. Allison, vice-president of the American Arch Company, were asking yesterday morning why it was that "Bill" had not come to the conventions this year. They will be glad to know that he is here and on the job, his name being omitted from the list of representatives of his company through an oversight.

George Wagstaff, of the American Arch Company, in "Uncle George's Primer," specifically states in the preface that it is not his intention to be technical. Is this a joke? The first part of the answer to the third question, for instance, reads: "By virtue of its position the brick arch

J. S. Sheafe, Master Mechanic, Baltimore & Ohio

becomes an incandescent refractory barrier between the furnace chamber and the outlet of the products of combustion, etc."

W. E. Symons, consulting engineer, has been pretty busy lately in connection with investigations into the proportion of operating cost which should be assessed against locomotives and cars for terminal and road charges. On the basis of these studies he has testified at several of the law suits in southwestern states to good effect.

J. C. Little, mechanical engineer of the Chicago & North Western, has been leading a strenuous life for the past few weeks. The building in which his office was located was burned some time ago and about 1,200 tracings which were not in the vault were destroyed. Among these was a set of drawings for a new stock car which was just being designed and of which no copies had been made. Outside of this, however, it is hoped that with the aid of an extra staff of draftsmen the other drawings will be fully replaced within a short time.

Jack Daly, a boilermaker on the Philadelphia & Reading, has the distinction of having built a model locomotive which is attracting considerable attention both because of the neatness and care with which the details have been worked out and

the circumstances under which it was built. The model forms a part of the Q. & C. Company's exhibit, where it is in operation with Mr. Daly at the throttle. To complete the engine required four years of his spare time in the basement of his own home. At the time his wife was in a sanitarium recovering from a protracted illness and he was left in charge of two growing boys. With the exception of a small lathe and drill press only hand tools were used and these by a novice in all but the boilermaker's trade. The result is worthy of a skilled mechanic.

While we all know J. D. Hurley as a maker of pneumatic tools, it happens that he is also responsible for the Thor motorcycle. Like many other normally peaceful citizens of the railway supply fraternity, Mr. Hurley has been repeatedly asked to bid on implements of war needed by the allies. His latest inquiry was for a price on "one hundred motorcycles fitted with gun brackets," without specifications of any kind—just as though we were all in the habit of going about the country on power cycles fitted with guns. Many other requests for prices are fully as indefinite. They remind us of the days when foreign railways first began to buy American built locomotives in any considerable number. Most of the New York export houses at once jumped into the breach

F. H. Clark, General Superintendent of Motive Power, Baltimore & Ohio

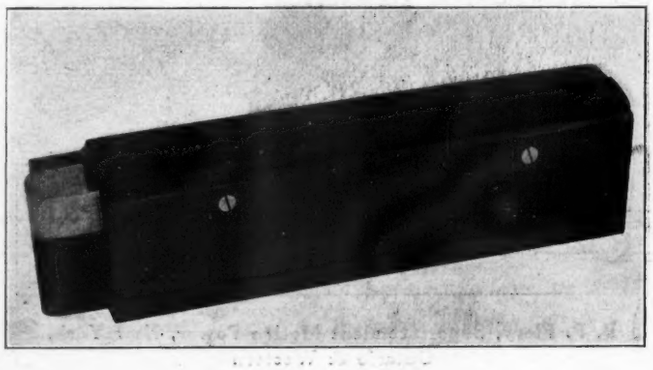
and asked for quotations on for example, "ten Forney type engines." Some of the war munitions inquiries are equally absurd.

The Rock Island lines are unusually well represented at the conventions this year. The delegation is headed by W. J. Tollerton, general mechanical superintendent, and includes the following: L. R. Richardson, mechanical superintendent first district, Des Moines, Ia.; G. W. Lillie, mechanical superintendent second district, Topeka, Kans.; R. S. Stewart, mechanical superintendent third district, El Reno, Okla.; George S. Goodwin and C. G. Chenoweth, mechanical engineers, Chicago; George W. Hartman, general air-brake inspector, Chicago; S. W. Mullinix, superintendent of the Silvis shops; J. N. Milton, superintendent car department, Chicago, and F. O. Bunnell, engineer of tests, Chicago. Two or three of the general car foremen will be here for the Master Car Builders' convention. Mr. Tollerton served as a member of the conference committee of managers which represented the western railways in the recent arbitration of their differences with their engineers and firemen. The result of the arbitration was that certain classes of employees were given increases in pay, but on the whole it was a victory for the railways.

TOOL HOLDER FOR HIGH SPEED STEEL CUTTERS

The tool holder shown in the illustration was designed by the Keystone Equipment Company, 21st and Clearfield streets, Philadelphia, Pa., with a view to protecting the cutting edge of the tool against both vertical and lateral strain. It is made of cold drawn steel and is case hardened to insure durability. In the top is a slot in which the high speed cutter is placed, set screws being provided through one side of the slot to hold the cutter in place. At the end where the cutting edge projects beyond the slot the body of the holder is extended below the tool and is so shaped as to form practically a continuation of the cutter itself. To protect the tool against the side pressure due to the feed, the back side of the slot is extended behind the projecting end of the tool.

The upper face of the cutter projects about 1-32 in. above the top of the holder and when clamped in the tool post the pressure is exerted directly against the cutter, firmly holding the tool in place. The only purpose of the set screws is to



Keystone Tool Holder

hold the cutter in the holder when not in place in the tool post.

The reinforcement provided by this holder is claimed to make possible the use of as high speeds and feeds with the small high speed steel cutter as are possible with a solid forged tool of the same size as the holder. The method of inserting the tool also reduces the waste of cutting steel since the tool may be used until it is too short to catch the set screw or clamps on the tool holder. Owing to the large area of contact between the cutter and the holder the transmission of heat from the cutting edge to the body of the holder is claimed to be especially rapid and to add to the life of the cutting edge.

The Keystone tool holders are made both right hand and left hand and for both round and square nose tools in 14 different sizes. A complete set of these tools is on exhibit at the booth of the manufacturer.

SEAMLESS DRAWN STEEL GEAR CASE.—A seamless and rivetless drawn steel motor gear case for use on electric cars has been developed which is adapted to withstand the vibration to which this part of the electrical equipment is constantly subjected. The manufacturing methods used in constructing these cases combine the operations of pressing and drawing in such a manner that the metal of the finished case is of uniform thickness and therefore well adapted to withstand vibration. These cases have been applied by the Pennsylvania Railroad on electric passenger cars for use on main line electrification. One of the Pennsylvania gear cases, which are of unusually large size, is being exhibited by the U. S. Metal and Manufacturing Company, New York, representing the manufacturers, the Chillingworth Manufacturing Company, Jersey City, N. J., in the southern and New England States.

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VOLUME 58 JUNE 11, 1915 NUMBER 24

Contents

*Illustrated.

The Railroad Disaster at Gretna

The Gretna train wreck, May 22, killing nearly 200 soldiers before they had even seen a battlefield, is briefly reported in another column. The British railway system, with the reputation of being the safest in the world, now records almost the worst train wreck ever known. Once more "a very small error produces a very great horror." The causes, in detail, are not fully explained; but there is enough explained so that it is easy to tell what American railway officers will say; they will congratulate each other on the popularity, and the extending use, in this country, of the track circuit and of automatic signals. Track circuits for a quarter mile at Quintinshill interlocking would have held the signals against that troop train. The track circuit system does indeed, show a percentage of failures, but the decimal has to be extended out with a good many ciphers to make the percentage comprehensible; and comparisons of automatic and non-automatic block signals, where comparisons are possible, show that proportionately the men make many more mistakes than do the machines. The English roads have made extensive installations of track-circuit locking at stations during the last few years, and this disaster undoubtedly will be followed by a rapid extension of this simple yet wonderful safeguard. This is the outstanding lesson of the calamity, far transcending all others.

Roads in the Hands of Receivers

In an editorial in these columns last week a comparison was made between the mileage and capitalization of roads in the hands of receivers at present, and on June 30, 1896, and the erroneous statement was made that the mileage of roads in the hands of receivers in 1896 was the greatest in the history of the United States. As a matter of fact, in 1895 there were 37,805 miles of road in the hands of receivers and in 1894, 40,817 miles, as against 30,475 miles in 1896 and approximately 30,500 miles at present. The comparisons of conditions in 1896 and at present, as given in the editorial last week, are of course correct, but the fact that there was 30 per cent more mileage in the hands of receivers two years previous to 1896 than in that year, is a fact which should have been stated in the editorial last week.

Passengers Must Declare Value of Baggage

On June 2 the eastern roads put into effect rules requiring all persons checking baggage for interstate transportation to sign a declaration of its value, and similar regulations are to be applied by the western lines. If the value of the baggage is declared to be in excess of $100 a charge of 10 cents for each $100 or fraction thereof over that amount will be made for insurance. This is one of the unexpected and probably unintended results of the Cummins amendment, which was jammed through Congress in the closing hours of the session which adjourned on March 4. Although the law has gone into effect without causing the general increase in freight rates which for a time it was thought would result from the careless way in which it was drawn, its application to baggage will hardly tend to increase the popularity of the senator whose name is attached to it. Heretofore the carriers have limited their liability for loss of or damage to baggage to $100. The Cummins act prohibits any limitation of their liability for property transported with the proviso that "if the goods are hidden from view by wrapping, boxing or other means, and the carrier is not notified as to the character of the goods, the carrier may require the shipper to specifically state in writing the value of the goods, and the carrier shall not be liable beyond the amount so specifically stated. The Interstate Commerce Commission has ruled that the provisions of the law apply to baggage. The railroads therefore cannot limit their liability for baggage unless they obtain a declaration of its value, which then constitutes the maximum amount recoverable from the company. If the new rules result in inconvenience to the traveling public, as they doubtless will, the public can place the blame not on the railroads, but on its representatives in Congress who passed such a law without taking time to consider the conditions to which it applied. The railroads have endeavored to work out rules which will avoid the inconvenience to passengers as much as possible. The Pennsylvania has announced that it will require the declaration only where specifically required by the law—on baggage checked for interstate transportation—although some roads have taken the position that it will be simpler to apply the rules to both state and interstate transportation. Small blanks have been prepared on which the declaration may be made and signed, but once for several pieces of baggage at one time.

The act makes it a misdemeanor for passengers to misrepresent the value and under the rules, if the baggage masters for any reason fail to obtain a declaration the baggage will not be forwarded. The roads will not insist, however, that the owner make out the declaration in person. It may be done by a servant or member of the family. Strong protests are already being made by commercial travelers, especially those who carry samples of high value, and who will be required to pay the insurance charge each time they check baggage. One result of the rules will be that passengers will have to allow themselves more time for the checking of baggage at stations and the railroads are making every effort to secure full publicity, so that passengers may be prepared. The railroads, of course, as an offset to the revenue they will derive from the insurance, will be subjected to greater expense by the increased liability they are required to assume and the additional clerical expense of obtaining and recording the declarations which will have to be preserved for six years.

CHICAGO, ROCK ISLAND & PACIFIC HEARING

THE important points which were raised at the hearing before the Interstate Commerce Commission last week in regard to the Chicago, Rock Island & Pacific Railway Company's receivership were:

The immediate necessity of the appointment of a receiver and the propriety of the application for a receivership by some of the directors without consultation with the other directors or with the Sheldon Committee; the sharp and crazy advance in the Railway company's stock on the New York Stock Exchange in the latter part of March and early part of April and its sudden collapse after the receivership; the question as to the fundamental necessity of the appointment of a receiver at all; and the Interstate Commerce Commission's relations with this whole affair.

Roberts Walker, who has since been appointed general counsel for the receivers, took largely the responsibility for the application for receiver. This application was made nominally by a supply concern and was for a comparatively trifling sum. The company consented to the receivership and as was brought out at the hearing it was at the instigation of the company that the application was made. There is nothing inherently improper in this sort of proceeding. It is often necessary to have a creditor for a small sum bring proceedings in order to forestall an unfriendly receivership. On the other hand, Mr. Amster, who was a newly-elected director, felt that he should have been consulted before the application was made. The Sheldon committee which had co-operated in getting proxies for the annual meeting which took place in March was not consulted. The facts of the matter are probable that if the intention of the company to submit to receivership had been known by Mr. Amster and his counsel, every possible legal difficulty would have been placed in the way of the appointment of receivers. This accounts for the decision not to take Mr. Amster into the confidence of the majority directors. As has been previously pointed out in these columns, there are numerous conflicting interests within the majority Rock Island directorate. It was this conflict of interests which led to the application without consultation with the Sheldon committee, but while this is probably the real explanation, it does not make the manner of application for the receivership defensible.

The Missouri Pacific's tangled affairs are being straightened out by co-operation and consultation between the various interests affected. It is to be regretted and very much deplored that in the matter of the Rock Island receivership a similar course could not have been followed.

Mr. Amster claims that he could have raised $6,000,000, to do which he would have had to pay off a lien of $4,100,000, which was secured by collateral on which he had planned to raise $6,000,000. This would have left $1,900 000 net new money. The receivers have found it necessary to issue $1,494,000 receivers' certificates and to keep in the treasury $505,000, which would have had to be paid on equipment notes May 1, but which has been deferred under the period of grace provision in the indenture. This is a total of $1,999,000 which the receivers found immediately necessary against $1,900,000 which Mr. Amster would have raised, to temporarily tide over the May 1 crisis. While the consideration of these facts is not entirely conclusive in answering the first point mentioned above as having been raised by the Interstate Commerce Commission's hearing, it would lead nearly any fair-minded outsider to the belief that there was no more immediate reason for the appointment of receivers on April 1 than on April 20, at least insofar as the company's interests as distinguished from the private interests of the directors were concerned. Furthermore, the method of application was questionable, and coming as it did from the interests which have already been so severely criticized for their theories of high finance is to be deplored.

Samuel Untermeyer, who plays a somewhat dual role in this Rock Island investigation, as protector of minority stock holders and aid to Gov. Folk, the Interstate Commerce Commission's counsel, insinuated that the high stock prices for the Chicago, Rock Island & Pacific the latter part of March were the result of the rigging of the market by speculators associated with the Reid-Moore people. It was obvious to anyone that the market in Rock Island shares, when they were selling up to 39, was an artificial one. There was no testimony which was undeniably conclusive that any of the insiders helped to create this high price. On the contrary, Mr. Amster and his counsel have accused the Moore-Reid people and President Mudge of giving out bearish interviews in regard to their own stock. The whole stock movement looked far more like an attempt of a clique of comparatively small speculators to put up the price than any attempt on the part of the controlling interests to make a market on which they could unload their holdings.

As to the fundamental necessity for the receivership for the Chicago, Rock Island & Pacific, the *Railway Age Gazette* has already expressed some views in the issue of April 23. The Sheldon committee when they first began to ask for proxies for the annual meeting had an expert make a report on the physical needs of the property and previous to that the management had come to the conclusion that a very considerable amount of new capital would have to be raised to conserve the assets of the company and to eventually increase its earning power to an extent which would make it possible to show a margin of safety above its interest charges. Against this expert testimony there is only the general statement of Mr. Amster and his associates that the property is a "fine property." It would appear to any disinterested student of Rock Island affairs that some readjustment of its finances was absolutely necessary. Whether or not such a readjustment could have been made without the receivership if the conflicting interests had been willing to co-operate in the best interests of the property, it is impossible to say. Without passing final judgment one way or the other, it would appear that strong banking support and unity of interests could more easily have kept the Chicago, Rock Island & Pacific out of the hands of the receiver than the Missouri Pacific. But the Missouri Pacific had the strong banking support and the Rock Island didn't, and the consequence has been that the Missouri Pacific is in a fair way to be reorganized without a receivership, while the Rock Island had to seek the protection of the courts. That Mr. Amster's $1,900,000 could have been anything more than a temporary and extremely frail support is inconceivable. Various plans were put forward, but no one of them promises success, nor could any assurance be given that the stock-holders would raise the needed money, and in the meantime it was thought best to have the court's protection.

One thing must appear most unfortunate to anyone who really has the best interests of the thousands of security holders of the Chicago, Rock Island & Pacific, as well as the interests of the hundreds of thousands of other railroad security holders at heart, and that is that this sort of a tangle should have come up before the Interstate Commerce Commission. There are now

three proceedings in the courts. One an application to intervene in the receivership proceedings by minority stockholders represented by Mr. Amster. One a suit to recover from the directors approximately $7,500,000 which was lost when the St. Louis & San Francisco was divorced from the Rock Island, and the third a general suit in equity to prove that the April 12 meeting was illegal under the Illinois construction.

These are questions in which the courts will see that the minority stockholders and other security holders have a fair and open hearing, and it is in these suits that the wrong doing, if wrong doing there has been, of the Reid-Moore people can be and should be brought out and redress exacted.

LATERAL STRESSES IN RAILS

THE magnitude of the stresses, both vertical and lateral, created in rails by locomotives of various types running under different conditions has been the subject of serious discussion for many years. Such conclusions as have been drawn have been based largely on conjecture supported by occasional evidences of excessive stresses revealed by some accident or injury to the rail. As there has arisen during recent years a general feeling that we are approaching the limit of safety in the relation of wheel loads to track structure, there is a greater demand for accurate information regarding the stresses actually created in the track under service conditions. George L. Fowler's series of experiments, described in another column, is one of a limited number which have been undertaken recently to this end. While confined to a small number of measurements of the lateral stresses only at one location on tangent track, with one form of roadbed conditions and track construction, these experiments nevertheless bring out interesting and valuable information on a relatively unexplored subject. The tentative conclusions that the lateral stresses imposed on the rail at any particular point are dependent more on the condition of the roadbed than of the locomotive, and that track conditions are the controlling elements in track stresses, provide food for serious reflection on the part of maintenance of way officers. While the experiments could only approximate some of the unfavorable conditions with which a trackman has to contend continually, the uniformity of results secured gives weight to the conclusions reached. The insertion of a hump in one rail with a relatively long run-off, or of a hump in each rail not directly opposite, approximating a condition found where the track is out of surface or where low joints are prevalent, increased the lateral stresses very materially, particularly on the rebound. While the maintenance of surface has naturally been given the greatest attention on lines carrying high class passenger service to secure improved riding qualities, the increased stresses introduced in the rails because of rough track are a matter of serious concern under freight trains as well.

The effect of wide gage is also strikingly shown in the increased lashing of the engine and the accompanying increased intensity of the lateral stresses introduced, especially at the higher speeds. This is what one would expect and coincides with the increased wear of the rail under such conditions, observations of which have recently caused some roads to pay greater attention to this subject on tangents and to reduce the increased width formerly allowed on curves.

Studies such as this are not only valuable for the information they bring out directly, but for the light they shed on the general design of track and locomotives and the relations they bear to each other. While our track structure of today is not the result of theoretical design, but rather of rule-of-thumb practical methods which have been developed in the light of past experience, the continuance of tests such as these, and such as those being inaugurated by the joint committee of the American Railway Engineering Association and the American Society of Civil Engineers, will do much to harmonize practice and theory and to develop a more rational design of track.

CO-OPERATION WITH THE PRESS IN A GOOD CAUSE

JAMES A. McCREA, general manager of the Long Island, is conducting a campaign of public education in an attempt to cut down the quite appalling number of automobile accidents that occur at grade crossings each summer on Long Island. A brief description of the first steps which have been taken is published elsewhere in this issue. One of the most remarkable things, however, about this campaign is the success which has been met with in getting the whole-hearted co-operation of the newspapers published in New York. Every paper of any size is giving its support either through a description or picture of the signs which the Long Island is putting up, or by such a description and editorial comment. Such unanimous support as this is interesting and encouraging. It is primarily the result of two factors: a good cause and the devotion to this cause of the personal time and interest of Mr. McCrea. After a great deal of thought and care had been given to the campaign Mr. McCrea decided to give up two days of his own time entirely to talking over with newspaper editors the aims of his company and the methods which were to be used to further them. As a matter of fact it was probably more nearly a week than two days which was given up to this work, but it has already proved to be time well spent.

Of course, no campaign of publicity and of education could entirely eliminate reckless automobile driving and resulting accidents at grade crossings. On the other hand it is safe to say that there are many thousand automobile drivers on Long Island who are thoughtless rather than wantonly reckless. It is at this class of driver that the railroad's campaign of education is aimed, and the annals of advertising prove pretty conclusively that when a cause is as good as this one, and when it gets the amount of newspaper discussion that is being given to the Long Island's Safety First campaign, results almost inevitably follow.

After all it must be a rather careless and habitually reckless man who can pass a sign 50 ft. long with the reminder staring him in the face that the heeding of that sign may save his life today, who is not just a bit more careful, for a few hours at least, in approaching grade crossings. So far as the Long Island Railroad is concerned, the success which the officers hope to obtain in cutting down the number of accidents at grade crossings is a thing of paramount interest and the methods by which this success is obtained are of secondary interest.

To other railroad men, however, whose particular problems in this respect may be quite different and to whom the grade crossing problem may not necessarily be the most important problem for the solution of which they must obtain the co-operation of the public, the chief interest in the Long Island's campaign of education is the method by which the railroad corporation has obtained this great measure of newspaper support. There is an important lesson in the experience of the Long Island which is almost as old as the history of railroads in this country. Each time, however, that the principles which underlie the Long Island's success are demonstrated in practice the results obtained come almost as a revelation. This is because these principles are applied on a large scale by railroad companies in comparatively few instances. Of course in the main this is necessarily so. A routine has to be followed and there is no "news" in routine. It is in exceptional cases that there is "news."

The editor or managing editor of a large metropolitan daily newspaper ranks in intelligence with the president or the general manager of a large railroad company. The daily newspaper editor is more open to conviction than the ordinary business man. His outlook is generally far broader, and his profession, like the railroad man's, is "public service." A public service corporation can almost invariably get the co-operation of the better class of newspapers, if not of all newspapers, if the railroad man is willing to discuss his cause with the newspaper man and set it forth in such a way that it stands on its own merits.

ELECTRIFICATION OF THE NORFOLK & WESTERN

WHILE the electrification of the New York, New Haven & Hartford from New York to New Haven is for freight as well as passenger operation, it was brought about primarily by the necessity for the elimination of steam locomotives in passenger service at the Grand Central Terminal, New York City. Similar conditions have led to electrification at other points. The Norfolk & Western electrification between Bluefield, W. Va., and Vivian, described in the *Railway Age Gazette* of June 4, was not decided on because of conditions such as these, but to secure an increase in track and tunnel capacity and in economy of operation. While the Chicago, Milwaukee & St. Paul is now electrifying 220 miles of its main lines in Montana for reasons of economy, the Norfolk & Western is the first trunk line to adopt electric operation on a portion of its main line for these reasons.

Only 30 miles is electrified at this time, but this section is adapted to electric operation, because for most purposes it comprises a separate division. Over 72 per cent of the freight traffic of the Norfolk & Western consists of coal and coke, and this percentage is increasing steadily. Practically all of this business originates within the limits of the electrified zone. Over 23,000,000 tons of revenue coal alone was handled last year. When business is normal, about 2,000 cars are loaded daily. This 30 miles of line is, therefore, one of intensive traffic development. Nearly all of this coal originates west of Elkhorn tunnel, about 40 per cent of it going east. Over 700,000 tons was unloaded over the Lamberts Point, Norfolk, coal pier alone last month. This coal must be brought from the mines to the main line, the eastbound loads separated from the westbound and the former hauled up the 2 per cent grade through Elkhorn tunnel to Bluefield. The westbound coal is taken to Eckman yard, a short distance east of Vivian, where it is made up into trains for further movement. Thus, for this coal traffic the electric locomotives will entirely replace steam without increasing the constructive mileage for steam locomotives, as has so frequently resulted.

From the standpoint of increased capacity, the article on this project in the issue of June 4 showed that the time required to clear the block through the single track tunnel is reduced one-half by electric operation, while the speed of the tonnage trains up the grades is similarly increased. The desirability of securing this greater expedition in the movement of trains is indicated by the fact that the total revenue coal traffic of the Norfolk & Western increased from 13,986,054 tons in the fiscal year 1910, to 23,221,742 tons in 1914, or 66 per cent, while that over the piers at Norfolk alone increased from 4,293,087 tons in 1910 to 5,986,910 tons in 1914, or 40 per cent. It is thus clear that the saving in the cost of constructing additional track facilities to provide the same increase in capacity will to a considerable extent pay for the electrification. Railway men will watch with much interest the actual results secured from the installation, since it is the first placed in operation to secure advantages from the purely railway standpoint, without other complicating features.

NEW BOOKS

A History of Travel in America. By Seymour Dunbar. The Bobbs-Merrill Company, Indianapolis. Four volumes, 400 illustrations, 1,600 pages. Bound in cloth. Price $10.

This is an interesting set of volumes showing the evolution of passenger transportation in America from the days of the Indian trail to the days of the railroad. The book has an historical value, for, although it, perhaps, touches primarily upon the more romantic and striking characteristics of its subject, it nevertheless conveys a remarkably clear idea of the effect of transportation upon the gradual extension of this nation westward from the Atlantic coast to the Pacific. The early part of the book, naturally, does not deal with railroads. The experiences of our forefathers who had to entrust themselves to Indian canoes, flat boats, river barges, or stage coaches and Conestoga wagons were so spectacular, however, that the first two volumes cannot fail to have their appeal to modern makers of transportation.

The book contains a detailed description of the introduction of the steamboat, emphasizing the fact, not too well known, that Fulton was by no means the real originator of water craft propelled by steam. The story of the introduction of the steamboat on the western waters of the country is especially attractive despite the emphasis placed upon the unsafe character of early river travel. The book tells also in detail of the many projects for canals, treats of their success or failure and gives a carefully compiled list of those that were completed. It describes travel upon the canal boats which at one time were very popular. These boats traveled at the prodigious speed of 3 or 4 miles an hour and the passenger paid usually 5 cents a mile including meals and bed.

The story of our railroads occupies a large portion of the books, but nevertheless not all that it deserves. The account is carried through from the beginning of rail transportation to the completion of the first transcontinental railroad. Definite data is given relative to the first railway, the first locomotives, the first trains, this being information that is always in demand and always hard to find in concise form.

The book treats carefully of the several early railroad lines. It names their routes, describes the early methods of track construction, tells of the difficulties with motive power and cars and treats of the lack of standard gages. It would, perhaps, be much more valuable in this connection did it contain maps showing these many lines, and it is a serious fault that these early railroads are not identified with the systems of which they are now parts.

In following the history of the early railroads, it is most interesting to observe the gradual introduction of new ideas. The first railroads had to choose between horses and steam locomotives. The first cars were stage coaches, and it was only gradually that the stage coach equipment evolved into a modern car with perpendicular lines and center aisles. The book does not neglect to mention the introduction of dining and sleeping cars and the various other modern necessities of our transportation system.

The reader is at a loss, however, to know why the author's treatment of our railroads should end at 1869. Surely the romantic features did not cease with the construction of the first transcontinental railway. The introduction of our signal system, a subject which is hardly touched upon, in itself should surely be of greatest interest. Nor does the book say a word about the part played by the railroads in the Civil War. One can well imagine how rich such material would prove at present.

Several chapters in the four volumes are devoted to the effects of the extension of the various new methods of transportation upon the settlement of the West, and it is from this that the book secures historical value. It is somewhat unfortunate, however, that so many chapters should have been set aside for consideration of the Indian problem. While that is an interesting and vital chapter of this country's history, it is not necessarily as important a part of the history of its transportation. A large part of the space used for the treatment of this subject could, therefore, perhaps be better used for a more adequate treatment of the public land policy, as the latter is certainly more closely related to the history of this country's transportation, particularly in so far as railroads are concerned.

The four volumes are most profusely illustrated. That part of the book which deals with the early history of the railroads, however, suffers slightly because in many chapters the illustrations are placed 100 or more pages ahead of the reading matter to which they are related.

To the person who desires to obtain a clear idea of the advance in the art of passenger transportation in this country the book is of greatest value. Its illustrations, the typographical work and the well chosen language make it most interesting.

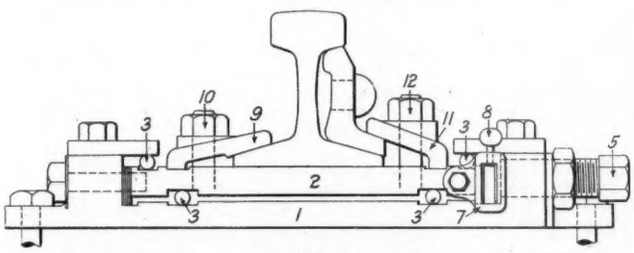
Lateral Stresses in Rails on Straight Track

Several Types of Locomotives Were Experimented With at Varying Speeds and Under Different Conditions

By George L. Fowler
Consulting Mechanical Engineer

The lateral stresses imposed on rails by running locomotives and cars have been the subject of much conjecture, some calculation and a little experimentation for a number of years, and the little of the last tends to show the unreliability of the other two methods of determination. It has been my good fortune to have conducted a series of investigations, the results of which may serve as indications of what probably exists, even though they may not be accepted as a final demonstration from which there can be no question.

The investigations were limited, for the most part, to the determination of the stresses imposed by locomotives. They may be divided into two parts: one in which the thrust of the locomotive as a whole, was measured on a tangent track, and the other in which the thrust of each individual wheel was measured on the outer rail of curves. In the case of the thrusts on the tangent it was the total lateral thrust that was measured and not the individual thrust of each wheel. Also, from the methods employed, it is impossible to state positively whether the records obtained were



Apparatus Used for Registering Lateral Stresses on Rails

those resulting from a single impact of a wheel against the rail or from the accumulated results of a series of impacts. But for the purposes of discussion they are considered to be the result of the impact of the engine as a whole.

THE TEST APPARATUS

The apparatus used for measuring the stresses is shown in the drawing. The rail was rigidly clamped to the plate 2 by the clamps 9 and 11 and the studs 10 and 12, a variation in form being made according to location, with provision for clasping the flange of the rail itself, or the splice bar at the joints. The whole was carried in the cast steel base 1, which was bolted to the tie in place of the usual tie plate. Plate 2 was floated on this base, being carried and held down by the rollers 3. When the apparatus was not in use the rail was adjusted to gage and held by bolts in place of those marked 5. When in service the bolt 5 was inserted, which carried a 1 in. hardened steel ball at its inner end. The clamp 7 attached to the plate 2 was provided with a thumb screw 8 for holding a cold drawn steel strip. This steel strip was interposed between the plate 2, against which it had a bearing and the ball on the end of the bolt 5. The bearing of this ball on the steel strip was all that prevented the spreading of the track as the locomotive passed. The result was that the outward pressure set up by the locomotive caused the ball to make an indentation in the strip the size of which indicated the amount of pressure exerted.

There were 120 of these units. The rail was of 85 lb. section. The ties were spaced 22 in. between centers and were laid in gravel ballast that came up flush with the top; the depth of the ballast beneath the ties was about 12 in. The location was on a fill about 5 ft. high, built on a muskeg foundation that was very elastic. A passing train produced a wave motion of the whole track that was quite visible to the eye, but no measurements were made of the height of the waves.

In placing the apparatus, great care was exercised that there should be no disturbance of the ties or ballast, and the bases 1 were allowed the same freedom of vertical motion on the ties that obtained in the track with the rails spiked down on the usual tie plate. In this way the rail conditions remained the same as in the normal track, with the single exception that they were raised 2 in. above the ties by the apparatus.

The steel plates used for the records were of cold drawn steel of a homogeneous structure, measuring ⅜ in. by 1¼ in. The metal was carefully calibrated to determine the relationship between the size of the indentation and the pressure required to produce it. The readings of the diameters of the impressions on the strips were made with a microscope worked with a micrometer screw reading to thousandths of an inch, but on which ten-thousandths were readily estimated.

The units or chairs were of such dimensions that the rail resting thereon was raised 2 in. above the ties. This necessitated a gradual rise from the regular track level to that of the apparatus. This run-off extended over a distance of three rail lengths in each direction, or at the rate of rise of 2 in. in 99 ft., or about 0.17 per cent. The run-off was carried on shims of varying thickness, so that there was no disturbance of the ties either at this point or under the units of the apparatus. The track was laid in a gravel ballast that dried out quickly after a rain. The ballast was well up to the tops of the ties at all points. The roadbed was springy and the whole surface of the ground and ties received a wavy motion under a passing train.

The tests were made in the month of August and during the whole period the weather was fair and dry and the condition of the roadbed uniform.

A speed recorder placed in the cab of the locomotive enabled the engineer to traverse the test track at any desired speed. The speeds selected for the tests were 30, 40 and 50 miles an hour for freight locomotives of the Consolidation and Mikado classes, and 30, 40, 50 and 60 miles an hour for passenger locomotives of the Pacific and Ten-wheel classes. The tests may be divided into two groups: those in which the rails and tracks were maintained in the regular, normal conditions of operation, and those in which humps or distortions were introduced in one or both rails.

It was found that there was a peculiar harmony in the range of high and low thrusts at the several units. A heavy thrust was apt to occur at the same tie in each of a series of runs and the same held for the lighter thrusts. When this recurrence became quite evident an explanation was sought in the vertical movement of the ties under the passing locomotives, but the improvisation for the work was too crude to give reliable results.

Following are some general data for the engines used in the tests:

	Mikado	Consolidation	Ten-Wheel	Pacific
Total weight, lb.....	225,000	226,000	167,000	219,000
Total wheel base....	35 ft. 5 in.	25 ft. 5 in.	24 ft. 11 in.	33 ft. 7 in.
Rigid wheel base....	16 ft. 5 in.	16 ft. 6 in.	14 ft. 6 in.	13 ft. 0 in.

All the locomotives had the standard Master Mechanics' Association tread, and each was surveyed to determine the amount of

lateral play in the journal boxes. All records were made with the engines using steam.

DETAILED RESULTS OF TESTS

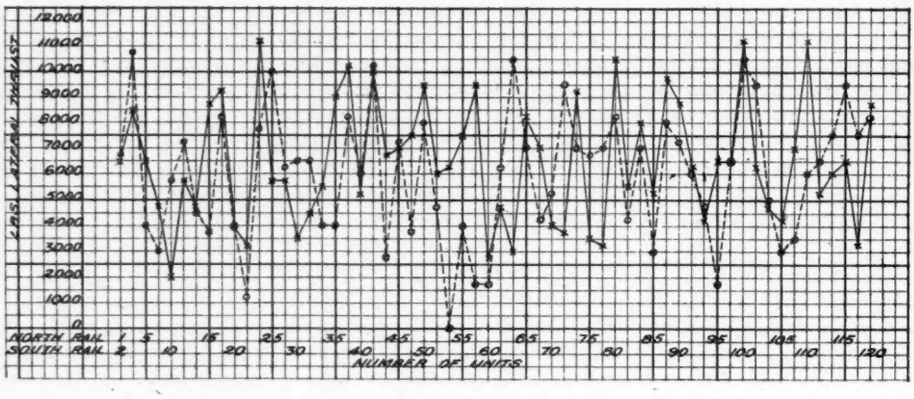
An examination of the diagrams plotted from the records shows that, in no case when the track was in its normal position, was there any indication of a tendency on the part of any of the locomotives to nose, that is, to move from one rail to the other and thus exert a maximum pressure on one, and a minimum pressure on the other. There was considerable lashing or dealing of heavy blows on one side or the other, but there was no uniformity in this, in so far as the delivery of a heavy blow at one end of the tie was accompanied by a slight blow at the other end.

Again, if we examine the averages of all blows struck on either rail they will be found to be remarkably uniform and with but a slight, if any, tendency to rise with the speed. The same statement holds for the maximum blow. It is noticeable that from August 5 to 8, inclusive, the highest average of blows was on the north rail; while from August 10 to 14, inclusive (the date of the last runs with the normal track) the higher average of blows was on the south rail, regardless of the class of locomotive tested. There was no marked difference between the averages of pressures exerted by the different classes of locomotives.

EFFECT OF SIDE PLAY IN JOURNALS

In the tests on the normal rail two of the locomotives were new. One was a Mikado, No. 5034. If the diagrams of this new locomotive are compared with those of No. 5012, on which there was an accumulated side play of something more than three times as much for the total of all of the wheels, it will be found that there was a marked increase in the steadiness of motion of the engine with the greater amount of side play. In the old engine the lash was moderate and uniform up to 50 miles an hour, with but a slight tendency to increase up to that point. At 60 miles an hour the lashing was notably more severe than at the lower speed. In the case of the new locomotive, No. 5034, the lashing was severe throughout the whole range of the tests, but was not markedly greater at high than at low speeds.

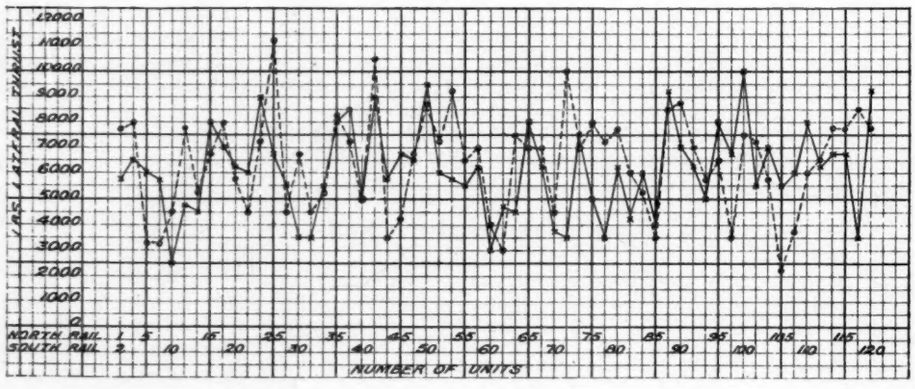
Consolidation engine 3950, tested on August 6, was also new, and Consolidation 3813, tested on August 13, was an old engine that had accumulated something more than three times the total amount of side play in the journal boxes obtaining on 3950. The same differences are to be noted as in the case of the Mikado just referred to. The worn engine, 3813, ran with remarkable smoothness showing a slight but gradual tendency to an increase of intensity of lashing as the speed was increased. The new engine, 3950, on the other hand, was very severe in its lashings, which also showed a slight tendency to increase as the speed was increased. Yet the average and maximum pressures exerted were not greatly different on the two engines, the difference between the two lying in the



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 6,496 lb. Maximum thrust, north rail..... 11,250 lb.
Average thrust, south rail..... 5,596 lb. Maximum thrust, south rail..... 10,500 lb.

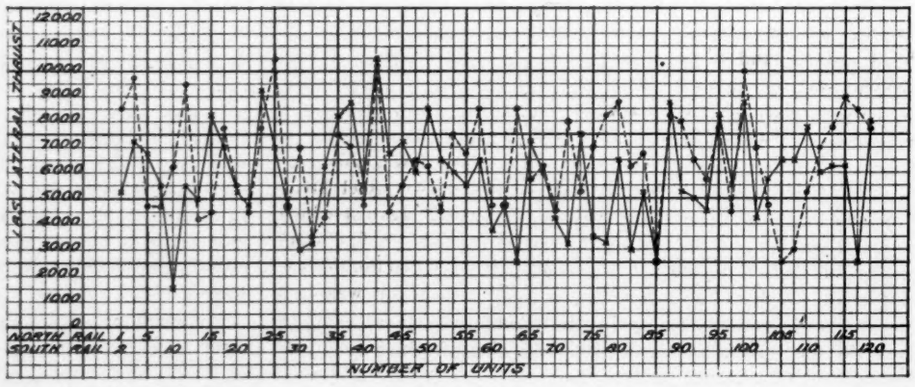
Lateral Track Stresses for Mikado Locomotive No. 5034 on Normal Track; Speed 52 Miles Per Hour; Test Made August 5, 1913



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 6,113 lb. Maximum thrust, north rail..... 10,000 lb.
Average thrust, south rail..... 6,450 lb. Maximum thrust, south rail..... 11,250 lb.

Lateral Track Stresses for Mikado Locomotive No. 5012 on Normal Track; Speed 30 Miles Per Hour; Test Made August 14, 1913



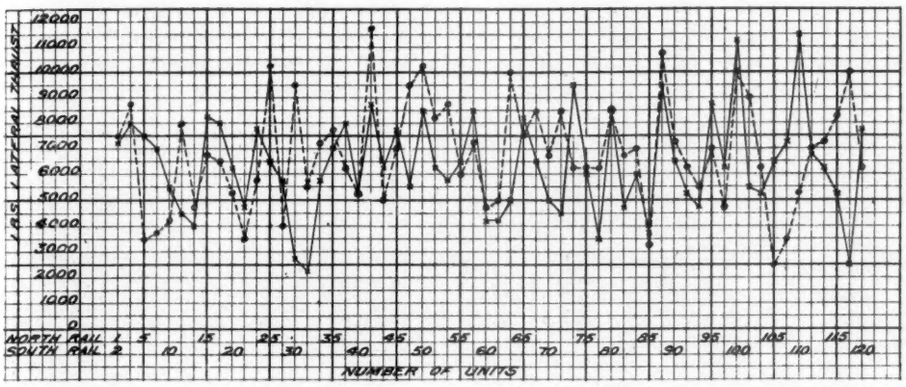
Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,842 lb. Maximum thrust, north rail..... 10,500 lb.
Average thrust, south rail..... 6,499 lb. Maximum thrust, south rail..... 10,500 lb.

Lateral Track Stresses for Mikado Locomotive No. 5012 on Normal Track; Speed 39 Miles Per Hour; Test Made August 14, 1913

rapid succession of blows which varied considerably in their intensity.

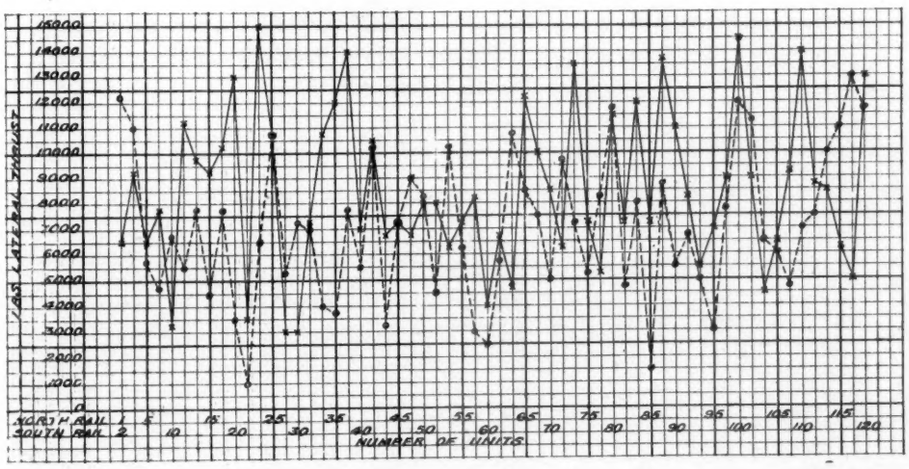
Basing the statement solely on these comparative records, it appears that the locomotive is easier on the rail after it has developed some side play in the axle boxes than when it is just out of the shops.



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 6,371 lb. Maximum thrust, north rail..... 11,500 lb.
Average thrust, south rail..... 6,829 lb. Maximum thrust, south rail..... 11,750 lb.

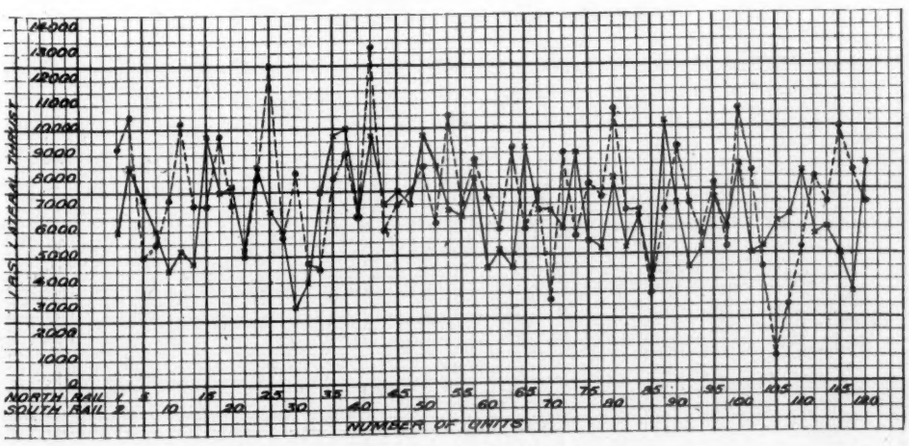
Lateral Track Stresses for Mikado Locomotive No. 5012 on Normal Track; Speed 50 Miles Per Hour; Test Made August 14, 1913



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 8,529 lb. Maximum thrust, north rail..... 15,000 lb.
Average thrust, south rail..... 7,037 lb. Maximum thrust, south rail..... 13,000 lb.

Lateral Track Stresses for Consolidation Locomotive No. 3950 on Normal Track; Speed 51 Miles Per Hour; Test Made August 6, 1913



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 6,675 lb. Maximum thrust, north rail..... 10,250 lb.
Average thrust, south rail..... 7,192 lb. Maximum thrust, south rail..... 13,250 lb.

Lateral Track Stresses for Consolidation Locomotive No. 3813 on Normal Track; Speed 50 Miles Per Hour; Test Made August 13, 1913

EFFECT OF DIFFERENT TYPES OF LOCOMOTIVES

As to the difference in the various types of locomotives, a comparison is possible between Pacific No. 1028; Consolidation Nos. 3921 and 3922; Mikado No. 5012 and Ten-wheel No. 919, all of which were fitted with the same type of trucks, and between Pacific No. 2229 and Consolidation No. 3819 which were fitted with another type.

Of these engines the smoothest diagrams were made by Ten-wheel No. 919, followed very closely by the Mikado No. 5012. There is very little to choose between the other three locomotives. On some runs the Pacific gave a slightly smoother record; on others it was in favor of the Consolidations. Considered together, the diagrams show the Pacific to be between the two Consolidations. From the diagrams it appears that the maximum blows in pounds delivered by the several locomotives on a normal track was as follows:

	Speed in Miles per Hour			
Type	30	40	50	60
Mikado—				
New	12,500	12,500	12,500	12,500
Worn	10,000	10,500	11,500	12,250
Consolidation—				
New	11,000	14,000	15,000	.....
Worn	10,250	13,500	12,750	.....
Pacific—				
Worn	13,250	14,000	12,250	12,250
Ten-Wheel—				
New	8,750	14,250	10,750	11,250

It was quite impossible to detect any consistent effect of rail joints. In some cases the greater thrust was at the last tie of the delivering rail, while on others it was on the first tie of the receiving rail, so that the effects were probably due to ballast and general track conditions rather than to the joints.

At the conclusion of the tests on the normal track, that is a track in which the average running conditions of a straight track were maintained as to the level of the two rails and the gage, it was decided to test the effects of a distorted track and various conditions were tried.

EFFECTS OF DISTORTED TRACK

The first change made was that of raising one (the south) rail ½ in. on the third tie in advance (east) of the apparatus or about 4 ft from it. There was a run-off at each end of about 4 ft. Two runs were made with the track in this condition at 30 and 40 miles an

hour respectively. The passage over the hump was not noticeable on the locomotive. The rise of the wheels was taken up by the compression of the springs, and the general appearance of the diagrams was unchanged. An examination of the two sets of diagrams of engine No. 5012 on the normal track at 30 and 40 miles an hour, shows them to be severally very similar, even in the details of their indications. The introduction of the hump disturbed this uniformity of action, but had no appreciable effect on the intensity of the blows delivered.

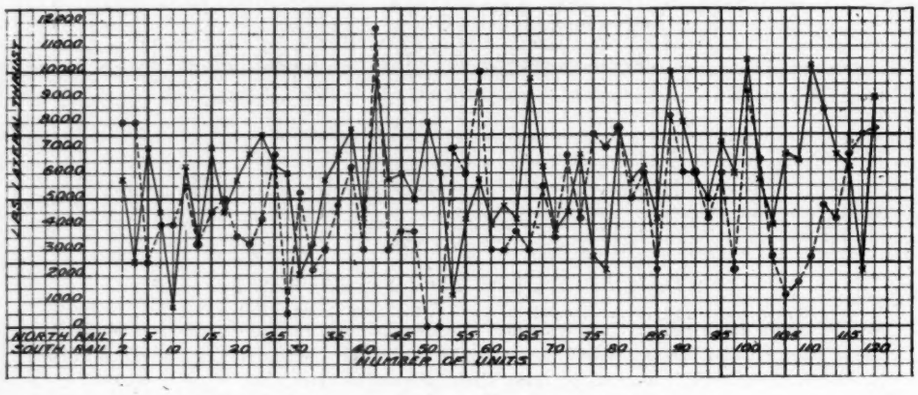
Owing to the slight effect produced by this distortion, the hump was raised to ¾ in. at the same place and engine No. 5012 was run over it at a speed of 30 miles an hour. This produced no more perceptible effect than the first distortion either on the engine or on the track.

The results of this distortion were that with engine No. 5012 running over the first hump of ½ in., which was short, at speeds of 30 and 40 miles an hour, there was no perceptible effect produced on the locomotive, when viewed from the track, nor was it perceptible on the engine. This held true also for the ¾ in. hump at the third tie when traversed at a speed of 30 miles an hour, making it evident that the momentary lifting of the wheels was cared for by the springs without moving the body of the locomotive itself, because of the short space of time during which the lifting force was in action.

In order to increase this time and give the springs an opportunity to act the hump was extended back from the third tie in advance of unit No. 2 for a full rail length at a height of ¾ in., and engine No. 5012 was run over it at speeds of 41 and 50 miles an hour. This produced an effect perceptible to the men on the engine, who could feel it rise, but did not feel any decided lateral blow when leaving the hump, nor was there any marked change in the character or intensity of the blows as indicated by the diagrams of the record.

Owing to the failure to produce results with a single short hump it was decided to introduce two humps, one on each rail. The north rail was raised for a length of 50 ft. and the south rail was raised for the same distance in advance of the apparatus. Mikado No. 5012 was run over it at speeds of 30, 41 and 49½ miles per hour.

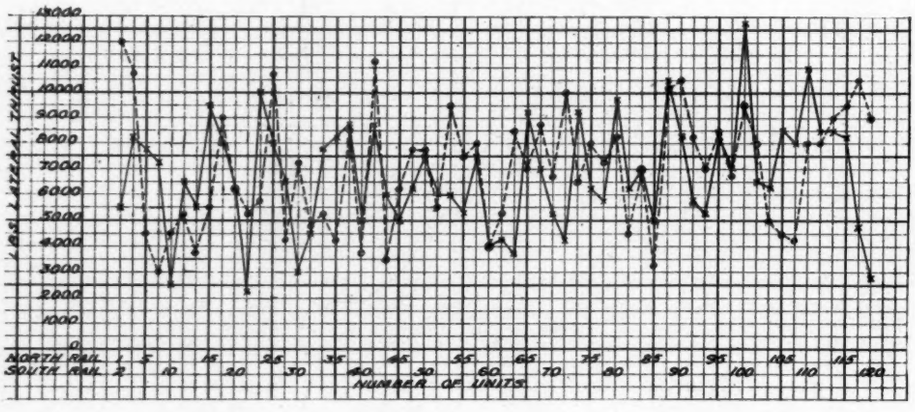
While this arrangement did not produce effects that were noticeable on the engine, it is evident from the diagrams that the lateral thrusts were very materially increased over those obtained on the normal track. On one run at 30 miles an hour a blow of 15,000 lb. was received on the south rail, and on both runs there was an increase of the heavy blows, especially on the south rail, with the engine running very steadily over the last half of the apparatus. These same results obtained at 41 miles an hour with a mere variation of the details. At 49½ miles an hour the lashing was increased and continued for the whole length of the apparatus. This showed that inequalities in track level, especially when alternating from



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,750 lb. Maximum thrust, north rail..... 10,500 lb.
Average thrust, south rail..... 4,825 lb. Maximum thrust, south rail..... 11,750 lb.

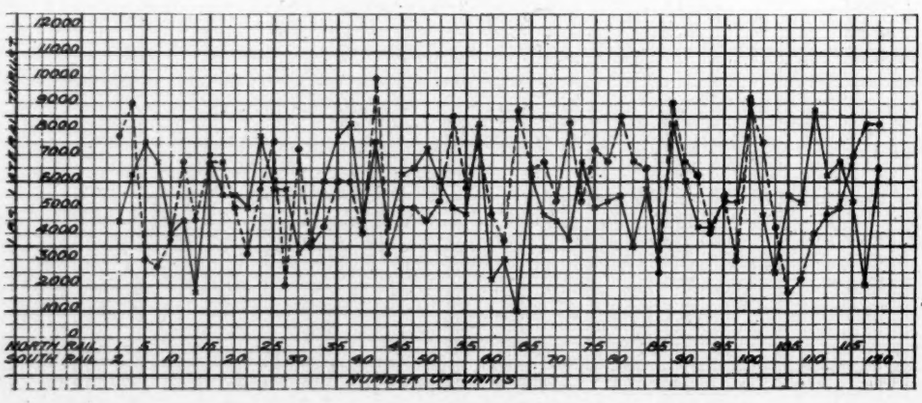
Lateral Track Stresses for Pacific Locomotive No. 1028 on Normal Track; Speed 50 Miles Per Hour; Test Made August 8, 1913



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 6,750 lb. Maximum thrust, north rail..... 12,750 lb.
Average thrust, south rail..... 7,042 lb. Maximum thrust, south rail..... 12,000 lb.

Lateral Track Stresses for Consolidation Locomotive No. 3921 on Normal Track; Speed 50 Miles Per Hour; Test Made August 7, 1913



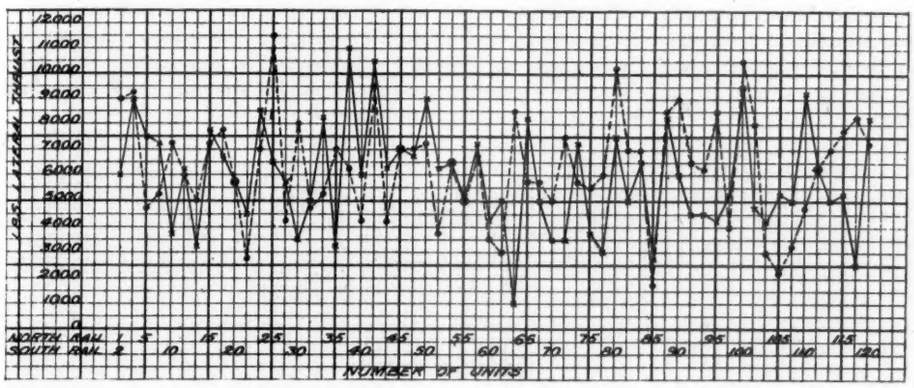
Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,382 lb. Maximum thrust, north rail..... 9,250 lb.
Average thrust, south rail..... 5,737 lb. Maximum thrust, south rail..... 10,000 lb.

Lateral Track Stresses for Pacific Locomotive No. 2229 on Normal Track; Speed 50 Miles Per Hour; Test Made August 10, 1913

one rail to the other, can set up side thrusts of considerable moment.

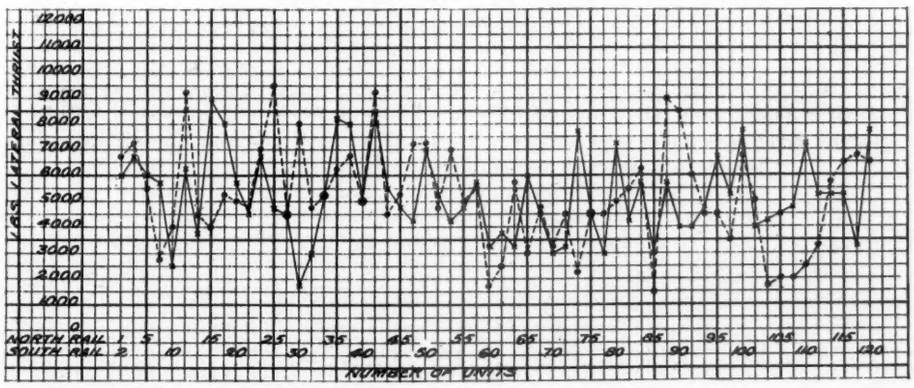
The next move was to place a hump in the north rail carrying it onto the apparatus itself and moving the two previous humps to the east or approaching side. This track was traversed at speeds of 30, 40, 45 and 46 miles an hour. At the higher speeds the engine was rolling to such an extent as to make it inadvisable to run any faster. Here we see, in a very marked manner the effect of throwing the engine over against the south by the hump in the north rail. The engine on entering the apparatus was dropped from the hump in the south rail and was lifted by that in the north. The result was a low pressure against the north rail and high ones against the south, rising to 15,000 lb. This was followed by a severe lashing that lasted throughout the whole length of the apparatus, causing a series of heavy blows, which while they did not raise the average or go very much above the maximum of the same engine on normal track, did show that the running of the engine was greatly disturbed.



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,904 lb. Maximum thrust, north rail..... 11,000 lb.
Average thrust, south rail..... 6,042 lb. Maximum thrust, south rail..... 11,500 lb.

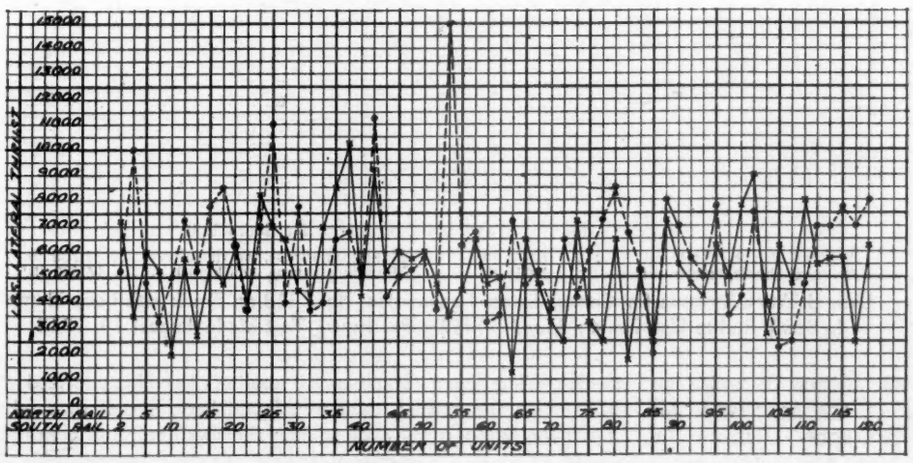
Lateral Track Stresses for Consolidation Locomotive No. 3922 on Normal Track; Speed 50 Miles Per Hour; Test Made August 11, 1913



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,229 lb. Maximum thrust, north rail..... 9,000 lb.
Average thrust, south rail..... 5,154 lb. Maximum thrust, south rail..... 9,500 lb.

Lateral Track Stresses for Ten-Wheel Locomotive No. 919 on Normal Track; Speed 50 Miles Per Hour; Test Made August 12, 1913



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,329 lb. Maximum thrust, north rail..... 10,250 lb.
Average thrust, south rail..... 5,979 lb. Maximum thrust, south rail..... 15,000 lb.

Lateral Track Stresses for Mikado Locomotive No. 5012 on Track with Two Humps Alternating on the Two Rails for 100 Feet East of Apparatus; Speed 30 Miles Per Hour; Test Made August 15, 1913

The track was again changed. The humps were taken out of the north rail and one long hump was put in the south rail extending well out on the apparatus. The purpose of this was to give the springs ample time to lift the engine and assume a condition of equilibrium, before the engine left the hump. The elevation of the south rail was ¾ in., and this extended for about 100 ft.

Runs were first made over this track with a Consolidation locomotive. The effect was very apparent and striking. The hump in the south rail threw the engine over against the north rail, with the result that the pressure against the south rail was very light, while that against the north rail was comparatively heavy. This held true to unit 14, where the hump practically disappeared, and there was a sudden rise in the thrusts against the south rail, culminating in a very heavy blow on unit No. 42. This showed clearly on the 30 mile diagram, increased very markedly at 39 and 40 miles an hour, and reached a maximum at 47 and 50 miles per hour.

After the engine had been thrown back against the south rail at 47 and 50 miles an hour, it maintained that position to unit No. 88, when it had crossed to the north rail. This tendency was also shown at 30 and 40 miles an hour, but not quite so markedly. While the averages of the thrusts were not much higher with the hump than they were with the normal track the maximum blows were very much higher. If, however, the average of the thrusts received are taken for the por-

tion of the track after the engine left the hump they are considerably higher than with the normal track. This shows that while an engine is traversing a single long hump, it is thrown over against the low rail and the side stresses on the latter are less than on a normal track with both rails level; while on the high rail they are inappreciable. But when the engine leaves the hump it is thrown violently against the rail in which the hump was situated and will deliver thrusts of from 20 to 30 per cent in excess of those delivered on a normal track with the two rails level.

Again the hump was extended, this time to unit No. 26. This hump was traversed by Consolidation locomotive No. 3950 at 30, 40, 46, 48 and 50 miles an hour. The effect was essentially the same as before. The engine lay over against the north rail, putting comparatively little pressure against the south rail up to unit No. 26, the end of the hump, when it crossed quickly to the south rail and put on high pressure, crossing at the higher speeds to the north rail and again imposing comparatively heavy loads there, and at the same time extending the lashing for the whole length of the track.

Pacific locomotive No. 1028 was run over the track in the above condition at 30, 40, 50, 50½, 60 and 61 miles an hour. The same general effect was produced as with Consolidation No. 3950, but more pronounced. The Pacific locomotive developed a heavier lashing than the Consolidation, and on this distorted track it carried the low pressure on the south rail out to the end of the hump on unit No. 26, and was then thrown back on that rail. It lay against it for nearly the whole length of the apparatus, only crossing back to the north rail at about units No. 100 to 106. This action appeared at 30 miles an hour, and increased to prominence as the speed increased until at 60 and 61 miles an hour there was a wide gap between the pressures on the two rails, and it was found that the Pacific locomotive put a much heavier stress on the south rail than the Consolidation. Evidently, too, the Pacific was much slower than the Consolidation in swinging from one rail to the other.

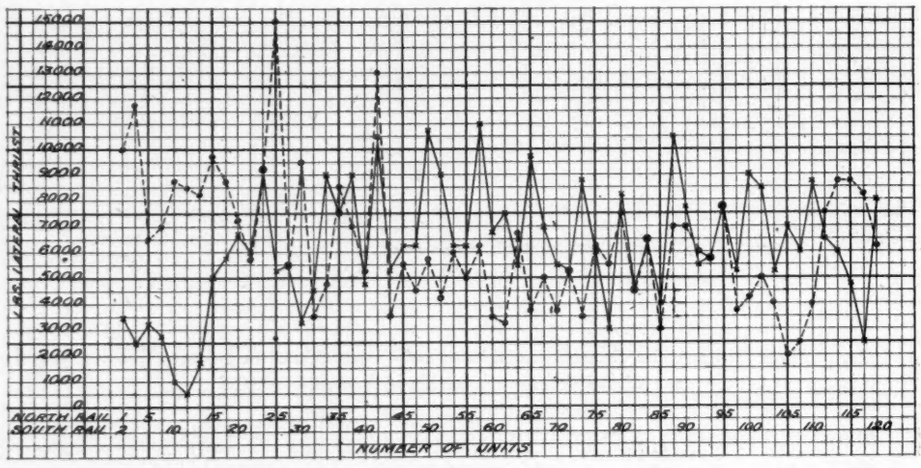
EFFECT OF WIDENING GAGE

The gage was then widened over the whole length of the apparatus by from 3/16 to ¼ in., and four runs were made at speeds of 30, 40, 50 and 58 miles an hour. The effect of the widening of the gage was not especially noticeable at 30 miles an hour. But as the speed increased the gap between the south and north rails increased, although the maximum blows delivered were not more. Apparently the extra play between the flanges and the rails, produced by the widening of the gage, gave the engine a chance to be thrown back against the south rail with enough greater force to hold it there with greater steadiness and relieve the north rail of a portion of its load, indicating that a loose gage tends to increase the lateral stresses which a locomotive will put on the track.

OTHER TESTS

The track was changed again by bringing the rails back to standard gage, but leaving the long hump extending down to unit No. 26, as in its first condition. Mikado locomotive 5012 was again run over the track with the long hump. The effect was the same, but less pronounced than with the Pacific locomotive. The same steadiness of motion that characterized the Mikado on the normal track was found here, except that, when it left the hump, it lay over against the south rail and continued to put an excess of pressure on that rail, as compared with the north rail, out to unit No. 105, when it sometimes crossed to the north rail, though it usually held to the south rail to the end.

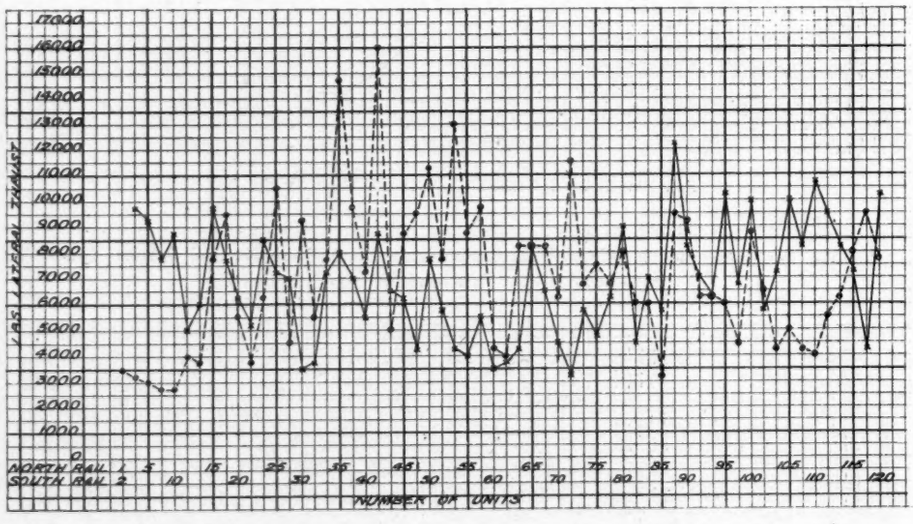
Taking the results obtained with the Pacific and Mikado locomotives, as compared with those of the Consolidations, it would appear that the trailer truck has a markedly steadying



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 6,021 lb. Maximum thrust, north rail..... 11,000 lb.
Average thrust, south rail..... 6,338 lb. Maximum thrust, south rail..... 15,000 lb.

Lateral Track Stresses for Mikado Locomotive No. 5012 on Track with Three Alternating Humps in Advance of Apparatus; Speed 45 Miles Pe Hour; Test Made August 15, 1913



Full Line is for North Rail and Dotted Line for South Rail

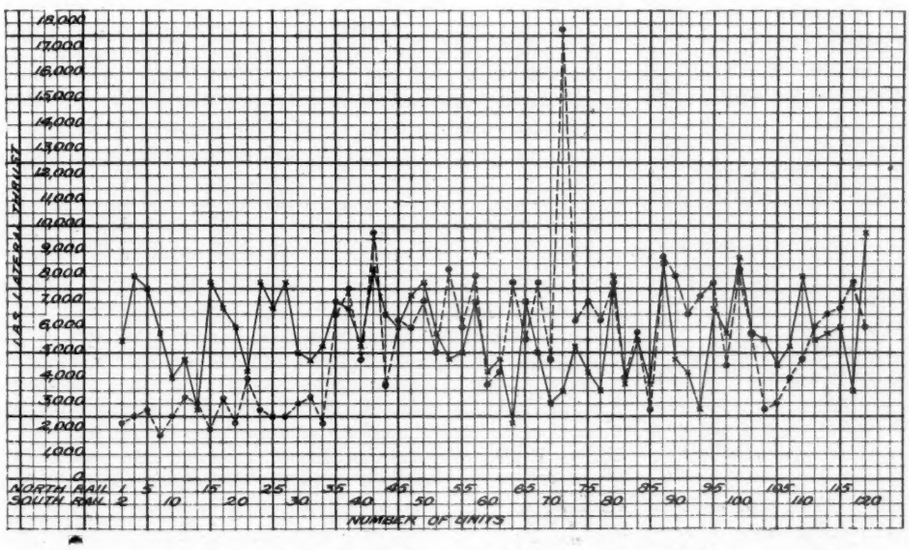
Average thrust, north rail..... 6,873 lb. Maximum thrust, north rail..... 12,250 lb.
Average thrust, south rail..... 7,021 lb. Maximum thrust, south rail..... 16,000 lb.

Lateral Track Stresses for Consolidation Locomotive No. 3813 on Track with Long Hump in South Rail to Unit No. 4; Speed 50 Miles Per Hour; Test Made August 16, 1913

effect to prevent lashing, and tends to hold the engine to the rail against which it has been thrown by running off from the hump. The hump, however, did not serve to raise the average thrusts of the engine on the north rail or the maximum for either rail to any extent, although the average for the south rail was higher for that portion after leaving the hump than when the track was in its normal condition.

On August 20, Pacific locomotive No. 2229 was run over the track. It was on this day that the rail deflections for each tie for each run were measured. A careful comparison of these deflections, as measured with the diagrams, fails to show any connection between the two. This, however, must not be taken to imply, in any way, that there is no connection, since the deflections were taken very crudely and cannot be assumed to represent the depression of the ties or the actual depression of the rail.

Pacific locomotive No. 2229 was also tested. It showed a general tendency that has already been noted, to lay over against the south rail after leaving the hump, but to a lesser degree. This engine had a swing link truck and a total side play in the axle boxes of 3 7/32 in., averaging 17/32 in. per axle. On the normal track it was quite steady and this same steadiness obtained when subjected to the action of the hump. The lashing



Full Line is for North Rail and Dotted Line for South Rail

Average thrust, north rail..... 5,704 lb. Maximum thrust, north rail..... 9,750 lb.
Average thrust, south rail..... 5,333 lb. Maximum thrust, south rail..... 17,750 lb.

Lateral Track Stresses for Ten-Wheel Locomotive No. 919 on Track with Long Hump in South Rail to Unit No. 26; Speed 49½ Miles Per Hour; Test Made August 22, 1913

effect increased with the speed and was quite severe at 50 miles an hour.

Runs were made with Consolidation locomotive No. 3925 at 30, 39, 40 and 48 miles an hour. The records of this engine may be compared with those of No. 3921. The diagrams showed the same low pressures against the south rail up to the end of the hump at unit No. 26, and beyond. Then there was a transference of the pressure to the south rail, with the engine laying up against it to the end of the apparatus. The run of maximum blows was higher than with No. 3921 on the normal track, and the lashing was somewhat more severe at the highest speeds, decreasing as the speed decreased down to 30 miles an hour. Engine No. 3925 has a total side play of 5 13/16 in. ranging from 9/16 in. in the second driver to 2 9/16 in. in the truck axle.

Attention has already been called to the smooth running of the Ten-wheel engine, No. 919. This engine was tested again on the humped track at speeds of 30, 40, 49½, 59½, 60 and 61 miles an hour. When running on the hump it showed the same low even pressure on the south rail that all of the others had, then a crossing at the end of the hump to put the higher pressure on the south rail; but, beyond that, there was an almost entire absence of the heavy lashing effect of the other types of engines at high speeds. Even at 60 miles an hour the engine was very steady. The only exception was to be found at 49½ miles an hour, where a blow of 17,500 lb. was struck at unit No. 72, but the engine quieted down immediately and showed no further tendency to lash, out to the end of the apparatus. Hence here, as on the normal track the Ten-wheel engine showed that it tended to put less stress on the track than any of the other classes.

Finally a Consolidation locomotive was backed over the apparatus at a speed of 30 miles an hour. The effect of the hump on this locomotive was very marked when running ahead. Not only were the maximum blows delivered higher than those of the same engine on the normal track, but the plunge over to the south rail, when it ran off the hump, was very decided. This was indicated especially by a blow delivered to unit No. 42, a blow that increased with the speed and was sometimes followed by a heavy blow on a succeeding unit. Evidently the engine went back to the north rail as unit No. 87 gave evidence of heavy blows.

Contrary to the action of the Consolidation locomotives when backing over curves, the action of such an engine backing on a straight track does not differ essentially from its action when moving forward. In fact, in the latter case, the stresses was much more severe when running forward than when running backwards.

As in the previous trial with the widened gage, the effect was not noticeable at 30 miles an hour. At 40 miles an hour, it was more distinctive, showing the same tendency to increase the lateral stresses as the speed increased.

GENERAL CONCLUSIONS

Reviewing the whole series of tests they may be said to furnish the following indications, although the work has not yet been carried to the point where the conclusions reached can be said to have been demonstrated.

The probability is that the blow delivered or the stress imposed at any particular point is dependent more on the condition of the roadbed than of the locomotive. This is shown by the marked similarity of the diagrams of any particular locomotive, whereon it will be seen that the heavy and light blows are apt to occur at the same unit respectively, regardless of the speed at which the engine may be running. This checks with observations made elsewhere.

There is no tendency for locomotives to nose, that is to go from one rail to the other at regular or irregular intervals, and, in so doing put a heavy pressure on one rail while there is a light one on the other. Nor when the engine or wheels come up against the rail is it usual for the pressure to increase gradually over a number of ties. The maximum pressure is apt to follow a comparatively low pressure on the same rail. In fact, it is quite characteristic of the diagrams to show an excessively high pressure immediately succeeding an abnormally low one.

A goodly amount of side play in the axle boxes evidently serves to relieve the lateral thrust of the wheel on the rail. It is as though the wheels and axles were free to move from side to side of the track while the main body of the engine continues on in a straight line undisturbed by the side movement of the wheels.

Judging from the diagrams presented, the order of severity of stresses put on the rails by the locomotives tested, indicates that they stand in the following order: Ten-wheel, Mikado, Pacific, Consolidation, increasing from the first to the last.

As already intimated track conditions are evidently of great importance in the development of lateral stresses, but no data was obtained showing what the effect in detail of track deflection or yielding may have upon the lateral stresses. Nor was any determination possible, from the data obtained, as to the effect of rail joints. There were, of course, no low joints on the apparatus used.

As far as the riding qualities of the engine, or the development of lateral stresses, a short hump or elevation of one rail has no appreciable effect, even though that rise be as much as ¾ in.

With two humps, one on each rail and alternated, so that the engine is not on both at the same time, there is an appreciable rise in the intensity of the lateral stresses.

With three humps, two on one rail and one on the other, alternated in the same manner, the engine will be given a rolling motion, which may become dangerous at high speeds, and which will produce a very marked increase in the intensity of the lateral stresses imposed on the rail.

Where one rail is elevated above the other for a considerable distance, giving the springs time to lift one side of the engine and come to a state of equilibrium, the effect is to cause the engine to strike against the rail in which the hump is located, when the engine leaves it. This may be followed by a rebound against the other rail. A widening of the gage tends to increase the lashing of the engine.

Contrary to its effect on curves, there is no appreciable increase of lateral thrust caused by backing a Consolidation locomotive over a straight track. This seems to hold, at least for moderate speeds.

While no demonstrative evidence to that effect was obtained, the impression left by these tests is that the track conditions are the controlling elements in track stresses. As to just what these may be, in detail, no statement can be made.

From these tests, as well as from those made on curves, it is evident that no prediction is yet possible as to what will be the effect of any individual locomotive, at any speed on any track, curved or straight. It can only be assumed that the performance of the engine will fall within the limits that are characteristic of its type.

In connection with these tests it is to be noticed that most of the locomotives tested had dissymmetrical wheel bases; that is to say, the number of truck wheels on either side of the drivers was unequal. This holds for all of the engines except the Mikados. It has been found in other investigations, that locomotives with dissymmetrical wheel bases are easier on the track and more stable than those having symmetrical bases.

QUARTERLY ACCIDENT BULLETIN No. 53

The Interstate Commerce Commission has issued Accident Bulletin No. 53, containing the record of railway accidents in the United States during July, August and September, 1914. The number of persons killed in train accidents was 181, and of injured 2,555.

The total number of casualties of all classes reported, including industrial accidents, was 2,748 killed and 47,215 injured. The accidents are summarized as follows:

Table No. 1—*Casualties to persons—Steam railways*

Causes.	Passengers		Employees (including employees not on duty)		Other persons (trespassers and non-trespassers		Total persons	
	Killed	Inj'd	Killed	Inj'd	Killed	Inj'd	Killed	Inj'd
Train accidents.								
Collisions	37	606	27	405	5	28	69	1,039
Derailments	36	850	39	381	28	59	103	1,290
Miscellaneous, including boiler explosions	...	10	8	213	1	3	9	226
Total	73	1,466	74	999	34	90	181	2,555
Other than train accidents.								
Accidents (229) to roadway or bridges not causing derailment	...	...	...	1	...	...	...	1
Other accidents (classes C3 to C12, inclusive)	44	2,215	470	10,200	1,954	3,640	2,468	16,055
Total	117	3,681	544	11,200	1,988	3,730	2,649	18,611
Industrial accidents to employees.								
While working on tracks or bridges	...	...	42	7,548	...	...	42	7,548
At stations, freight houses, engine-houses, etc.	...	...	19	6,304	...	...	19	6,304
In and around shops	...	...	17	13,177	...	...	17	13,177
On boats and wharves	...	...	9	432	...	...	9	432
At other places	...	...	12	1,143	...	...	12	1,143
Total	...	...	99	28,604	...	...	99	28,604
Grand total	117	3,681	643	39,804	1,988	3,730	2,748	47,215

The comparisons with the quarterly bulletin covering the corresponding quarter of the previous year shows* an increase in passengers killed in train accidents of 40 (33 to 73); employees killed (on duty) all causes, a decrease of 296 (759 to 463); employees killed in industrial accidents, a decrease of 33 (132 to 99) and a decrease in total persons killed, all classes, of 425 (3,173 to 2,748). The quarter now reported included three notable accidents: Tipton Ford, Mo., August 5, passengers killed, 36; Lebanon, Mo., September 15, passengers killed, 27; Livingston (Klondyke), Ala., September 18, passengers killed, 9.

The total number of collisions and derailments reported was 3,085 (1,095 collisions and 1,990 derailments), of which 97 collisions and 168 derailments affected passenger trains. The damage to cars, engines and roadway amounted to $2,342,511. A comparison with the same quarter in preceding years shows:

	Number	Killed	Inj'd	Damage
Total collisions and derailments this quarter	3,085	172	2,329	$2,342,511
Total for same quarter of 1913	3,913	208	3,760	3,239,159
1912	3,935	276	4,100	3,366,401
1911	3,034	189	3,776	2,533,170

The bulletin gives the usual tables classifying certain kinds of accidents in detail.

Fifteen accidents were investigated by the inspectors of the commission during this quarter, and the reports of these investigations fill 23 pages of the bulletin. These accidents occurred as follows:

Chicago & Alton	Lockport, Ill.	Jan. 3,	Derailment
Chic. St. P. Minn. & O.	Bigelow, Minn.	Feb. 9,	Derailment
Detroit, Jackson & Chic.	Michigan Center, Mich.	July 1,	Butting collision
Virginian	Fairmount Park, Va.	July 17,	Collision (st. cars)
Pennsylvania	Shannon, Pa.	July 23,	Derailment
Kansas City So.	Tipton Ford, Mo.	Aug. 5,	Butting collision
Tennessee Central	Green Hill, Tenn.	Aug. 13,	Derailment
Denver & Rio Grande	Thistle, Utah	Aug. 14,	Derailment
Chic. R. I. & P.	Calloway, Ark.	Aug. 21,	Derailment
Chic. St. P. Minn. & O.	Peak, Neb.	Aug. 27,	Butting collision
St. L. Iron Mt. & So.	Watson, Ark.	Sept. 14,	Butting collision
St. L. & S. F.	Lebanon, Mo.	Sept. 15,	Derailment
M. K. & T. of Texas	San Marcos, Tex.	Sept. 16,	Derailment
Alabama Great So.	Livingston, Ala.	Sept. 18,	Derailment
St. L. Iron Mt. & So.	Rixey, Ark.	Sept. 22,	Derailment

Electric railways reporting to the commission (not included in the foregoing statistics) had 125 persons killed during the quarter and 1,686 injured; and there were 44 collisions and 23 derailments. Train accidents are charged with 6 fatalities. The total number of passengers killed from all causes was 12, and of employees 15 (4 in industrial accidents). The number of trespassers struck or run over by cars was 49; 27 killed and 22 injured.

British Rail Exports.—The war is naturally telling upon English rail exports, the aggregate shipments to April 30 having fallen to 78,462 tons, as compared with 164,277 tons and 157,507 tons in the corresponding periods of the two former years.

Baghdad Railway Bridge Opened.—A Constantinople telegram states that the great bridge across the Euphrates near the railway station of Djerabulus, on the Baghdad Railway, has been opened for traffic.

*Preceding bulletins have been noticed in the *Railway Age Gazette* as follows: No. 52 (yearly), February 19, 1915, page 299; No. 51, December 11, 1914, page 1081; No. 50, July 24, 1914, page 170; No. 49, May 15, 1914, page 1072.

Federal Regulation of Railroads—A Suggestion

Division of the Country Into Districts and With Sub-Commissioners With Jurisdiction Over These Districts

By J. G. Code
General Manager, Wabash-Pittsburg Terminal

The "Act to Regulate Commerce," taking effect early in the year 1887, and based upon the constitutional authority of Congress to regulate foreign and interstate commerce, inaugurated a system of federal regulation and control of business interests of the greatest magnitude in themselves and so closely interwoven with the business and social activities of all the people as to make the manner, extent and character of regulation of vital importance as related to national welfare. The commission in its first annual report directed attention to this fact in the following words:

> The regulation of no other business would concern so many or such diversified interests or would affect in so many ways the result of enterprise, the prosperity of commercial and manufacturing ventures, the intellectual and social intercourse of the people, or the general comfort and convenience of the citizen in his every-day life. The railroads provide for the people facilities and convenience of a business and social nature which have become altogether indispensable, and the importance of so regulating these that the best results may be had, not by the general public alone, but by the owners of railroad property also, is quite beyond computation.

In the same report rendered after the act had been in operation about eight months it was noted that "one immediate effect was to cause inconvenience in many quarters," which comment is probably equally applicable to the situation after twenty-eight years of experience. This, however, is no indication that progress has not been made, nor good results obtained, as any restriction of individual or corporate action is practically certain to inconvenience some, even while generally beneficial.

The tremendous expansion of our resources in agriculture, mining, manufacturing, etc., during the latter half of the ninteenth century was made possible only by the rapid development of transportation facilities which, in many notable instances, proceeded materially in advance of actual needs, but in a manner to promote the opening of remote areas to population and all the activities of civilization. That in the public interests federal regulation became necessary, was adopted, justified its adoption, is therefore properly adhered to, and will be continued and made more extensive by the will of the people, are facts of the situation which for purposes of this discussion are assumed to be settled. I am also assuming and firmly believe that government ownership is not seriously considered by any great number of our people, and will not be until or unless the policy of regulation by commission has absolutely failed.

There is an old Scotch fairy tale of an enchanted flag given by a fay to a member of the Macleod clan. Thrice it would save him from the worst danger, but only thrice. After that it would be useless and must be burnt. As the story goes, Macleod waved the flag twice, once when his child heir was lost, again when the clan was hard pressed by enemies—but he never waved the flag the third time! Furled it lies in the treasure chamber of Dunvergan, while generations of Macleods bravely live and bravely die. No one of them will use the fairy's charm for the last time.

Government ownership is the last resort and its flag may well be kept in the treasure room of our castle, to be unfurled only when there is no other way to turn. Unlike the fairy banner, we can use it not thrice, but only once and must then abide the consequences.

Until very recently the repressive function of regulation has predominated. Naturally those features of the act aimed at the correction and prevention of abuses have been thoroughly worked to conclusion. There are now gratifying indications of an understanding that the function of repression of evil must be accompanied by cultivation of good through our instrumentalities of regulation if the people at large are to continue to enjoy the benefits of efficient transportation facilities. A broader conception of the duty devolving upon governmental authority will result in an extension of the powers of the commission, and a very considerable increase in the amount of work to be performed by it.

The suggestion which I wish to advance relates solely to the situation as it exists and to the very probable extension of the authority of the commission, and consequent increase in the amount of labor. Even though, as it now stands, a tremendous amount of business is handled by the commission, which docketed in the year 1913, 16,764 cases. There were conducted 1,401 hearings, in the course of which approximately 140,000 pages of testimony were taken, which represents a good sized printed volume for every working day in the year.

There has been no material change in the organization other than an increase in membership from five to seven and which it is now proposed to increase to nine. The quality of its membership has been well maintained, so that notwithstanding many acute differences of opinion, it must be conceded that we have a board composed of men ranking very high in ability, capacity, sincerity and devotion to the manifold tasks upon which they are continuously engaged.

The reference before made to the number of cases docketed, while indicating in a manner the volume of work directly handled or reviewed by the members of the commission, does not cover the entire work performed under the authority of the commission by its subordinate employees or bureaus, as of locomotive inspection, accounts, statistics and tariffs.

In working out the enforcement of the boiler inspection law it has been found desirable to locate the inspectors of this division at various points throughout the country in such a manner as to insure frequent observation of the locomotive boilers and appliances. That this organization is effective most of us know. The men are "on the job" and the figures reported by the chief inspector in his 1914 annual report showing 32 per cent decrease in the number of accidents, 36 per cent decrease in deaths and 32 per cent decrease in injuries as compared with the previous year are at least prima facie evidence of efficiency.

The division of accounts now maintains representatives in seven of our principal cities, where they are in close touch with the accounting features of our principal railroad systems. These men too are "on the job" and the theory of uniform accounting is being evolved into fact.

For valuation purposes the country has been divided into Eastern, Central, Western, Southern and Pacific divisions, with headquarters in four principal cities outside of Washington.

In the matter of hearings and investigations, however, the commission has no fixed local representation. Its principal office is in Washington and there is provision for the conduct of hearings and investigations by one or more commissioners in any part of the United States. This circuit riding feature was for a number of years frequently operative and it was quite the usual thing for members of the commission to conduct hearings at various points in the territory immediately concerned in the matters at issue. But as the work

*An address delivered before the Railway Club of Pittsburgh.

increased it became exceedingly difficult for members of the commission to absent themselves from headquarters at Washington until it is a rare occasion when a member of the commission takes direct charge of any proceeding at an outside point. Such are almost invariably conducted by subordinate representatives of the commission, known as lawyer examiners, who report to the commission for its review and action the evidence adduced, briefs filed and recommendations.

On account of the large amount of work and the probability that it will continue to increase, further addition to the membership of the commission has been proposed, and if it were wholly practicable to subdivide and assign to certain members a particular share of the duties, the end might be attained in this manner, which is workable, however, only in some minor matters.

Are not the work and territory involved and interests affected now great enough to subdivide in a more rational manner? I believe such to be the case, particularly as the development of successful regulation will require greater authority in the regulatory body, coupled with a greater degree of accountability to the whole people.

My suggestion, which I hope may be considered in the line of progress, is:

1. Divide the country into six districts—Eastern, Central, Southern, Southwestern, Northwestern and Pacific.

2. Assign to each district three sub-commissioners, with headquarters at convenient geographical locations in each district.

3. Let all hearings and investigations be conducted by these boards of sub-commissioners singly when intraterritorial, and by joint representation when interterritorial.

4. Forward to the Washington commission for review and decision the record of hearing and investigation, lawyers' briefs and sub-commissioners' recommendations as is now done in cases conducted by examiners.

5. Relieve the Washington commission generally of the direct conduct of hearings and investigations, except in cases of such importance as in their judgment may make it desirable for one or more of their members to sit with the local commissioners.

The personnel of all commissions is of vital importance. Salary and tenure of office should be such as to command experience, ability and honest devotion to the work. One member for each of the sub-commissions may well be assigned from the commission's corps of examiners, whose experience qualifies them to produce results. Give them a chance to settle down and get a thorough acquaintance with the transportation and business needs of a particular territory and they can do better work and more of it. One member on a sub-commission should certainly have general experience in the conduct of railway operations. A third member should be a representative of general business or shipping interests.

The benefits of such an organization are readily manifest. Among them may be cited:

1. Washington commission can give more concentrated and thorough attention to the larger problems and policies of regulation and control.

2. Washington commission can serve more efficiently in advisory capacity to Congress and the president. The chairman of the commission should be ex officio a member of the president's official family and on the same footing as a cabinet officer. The president and the Congress should have the benefit of the expert knowledge possessed by the commission in considering proposed legislation.

3. Local commissions should foster a better understanding and closer relationship and co-operation among all interests, including what is extremely important, state and other local regulatory commissions.

4. Business can be handled with greater expedition and we will have less standing still and marking time while waiting for action.

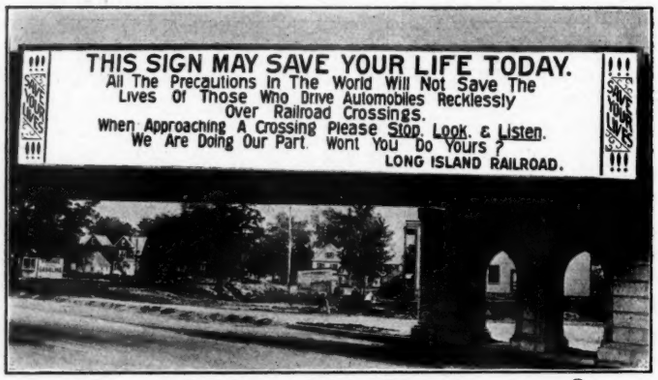
5. Much loss of time and long distance traveling may be avoided.

6. The commission will be "on the job."

SAFETY FIRST ON THE LONG ISLAND

The latest phase of the campaign for safety on the Long Island Railroad is the posting of signs on the highways, warning automobile drivers to be more careful at grade crossings. One of these signs, painted on a bridge, is shown in the accompanying engraving. This is at Broadway, Flushing, N. Y. It is 50 ft. long and about 10 ft. high. Other signs will be put on bridges at Winfield, Jamaica and other places, and also at places near grade crossings where the warning is likely to be useful. The signs are of different sizes, a common shape being 10 ft. wide and 10 ft. high. Some of the signs will be lighted at night. More than $15,000,000 has been spent already in the elimination of grade crossings on the Long Island, but there are still 631 crossings on the lines of this one railroad company. Work on the elimination of 32 more crossings is now in progress.

Coincidently with the posting of the signs the railroad company is publishing advertisements in the local newspapers. From



Sign on Broadway Bridge, Flushing, N. Y.

a series of several advertisements, the publication of which is to be spread over several weeks, we make the following extracts:

This is the first of a series of advertisements the sole purpose of which is to save life—your own life it may be or the lives of your family or friends. The automobile touring season is just beginning. Every year brings an increase in automobile accidents at grade crossings on Long Island. We have tried many ways to get people to be careful, but reckless driving is as common as ever. . . . We shall keep putting up more signs wherever they can do any good. *Look for them.*

A large percentage of the people hurt in grade crossing accidents on Long Island are people who are not familiar with the roads. Remember this when motoring on Long Island: When you see a railroad crossing sign, respect it! It may mean the saving of your life. You cannot miss the crossing sign. . . .

To take a chance at a crossing; to trust to luck to get across is worse than foolhardy; it is criminal. Let the sight of a grade-crossing sign instantly convey to you the warning to slow down or stop. It's the only way to be safe.

Even if you know none of the victims, there is a shock in reading the details of an accident to automobilists at grade crossings. . . . But how often do you take home the lessons your daily paper so constantly conveys? . . .

A train approaches a grade crossing. The gates drop, the automatic bells sound, or the flagman appears with his warning

lantern. But the chauffeur deliberately speeds up his car, smashes through the gates, and whirls across the tracks a hair's breadth ahead of the engine. Couldn't happen, you say? It happens at least once a week on Long Island. . . .

Remember where the grade crossings are and slow down or stop before you approach them. As fast as possible we are abolishing them. This is our part. Yours is the exercise of caution.

If you would always associate the sight of a grade crossing with the instant application of your motor's brakes—accidents to automobilists at grade crossings would soon be scarce. . . . Trains must run on tracks and on time. Their operators have no choice of routes. But the automobilist can choose his road and regulate his rate of speed.

Five hundred flagmen are on duty day and night at this railroad's grade crossings. We keep them there for your protection.

At the sight of a warning flag or lantern—stop your automobile.

STATISTICS OF ENGLISH RAILWAYS IN WAR TIME

BY JULIUS H. PARMELEE
Statistician, Bureau of Railway Economics

The virtual nationalization of the railways of Great Britain for the period of the European war has effected curious results, as regards both management and statistics of operation.

On August 4, 1914, the very day Great Britain and Germany locked horns, an Order in Council provided that the government should assume control of the railways of the United Kingdom. For this purpose an executive committee was created, composed of the general managers of a dozen selected railway companies, with the president of the Board of Trade as chairman ex-officio, and the general manager of the London & South Western as acting chairman. Beginning August 5, the railways have been administered as one system under the control of the government and in conjunction with the war office and the admiralty.

The annual reports of the English railways for the year ended December 31, 1914, reflect this government control in a number of aspects. By an arrangement perfected at the commencement of the period of control, the government agreed to compensate the railways for their services in connection with naval and military transport by guaranteeing them the same net revenues as were earned from rail operations during the corresponding period of the preceding year. In return, the railways have placed their facilities primarily at the disposal of the military organizations, and only secondarily at the disposal of the traveling public. All necessary expenditures are met by the railways, the government agreeing to make up any deficits and guaranteeing net revenues proportionate to those of the latest corresponding period of peace. Stating this differently, the government has practically commandeered the railways for its own use, paying therefor a sum equivalent to the deficit (if any) plus the normal net revenues of the period. The sole proviso is that if the net revenues for the first half of 1914 were less than for the corresponding period of 1913, a proportionate reduction is made in the net revenues for which the government stands guarantor.

Statistical interest centers in the form of accounts necessitated by these extraordinary conditions. The principal railways of England carry in their annual reports for 1914 a uniformly worded description of the arrangement with the government, and point out that the circumstances necessarily involve considerable alteration in the accounts and statistical returns for the year. The statements presented in these reports are prepared in the abridged form agreed upon with the Board of Trade.

The English railway reports for 1914 are, therefore, less detailed and contain fewer statistical tables than usual. None too enlightening at the very best, the reports now throw little light on actual operations. For example, the one vital account (No. 8, Revenue Receipts and Expenditure of the Whole Undertaking), which is the record of income and outgo for the year, is now made up almost wholly of two items. The income item is entitled "Receipts in respect of railway working, and of separate businesses carried on by the company, including estimated amount receivable under agreement with the government in respect of control of railways for the period August 5 to December 31, 1914," while the outgo item is entitled merely "Expenditures." These two heads cover transactions aggregating millions of pounds, without the slightest attempt at detail of any kind.

With the further sanction of the Board of Trade, the railways are varying the statutory form of accounts this year by omitting from their reports all accounts showing revenues and expenses in detail, especially the income account entitled "Receipts and expenditures in respect of railway working"; also statistical tables dealing with the auxiliary activities of the railways, such as the operation of omnibuses, steamboats, canals, docks, harbors, wharves, electric light and power plants, and so on; also the important records of passengers and freight carried, and the detailed traffic statistics. Whether these accounts are omitted for the sake of simplicity, or as a blind to the enemy, or to conceal actual conditions from the English public, is conjectural; but they serve to rob the reports of what little value they formerly possessed.

It is clear that the only item now remaining in the English railway accounts offering any index to business conditions is that of expenditures; for the traffic statistics have disappeared, and the income item is arbitrarily arrived at by adding expenses and normal net revenues. Comparison of the expenditures of the railways for the calendar year 1914 with those for 1913 is disappointing, therefore, in that little change is noted in either direction.

The available statistics cover 15,314 operated miles. The operating revenues for the calendar year 1914 amounted to $513,521,144, as compared with $505,656,203 in 1913; operating expenses in 1914 were $339,711,288, and in 1913 were $329,272,383.

A point of interest in the reports concerns the human side of the war—the enlistment of railway employees under the banners of the Empire. The London & North Western points with pride to 12,000 employees in the army and navy; "that they have acquitted themselves with honor is attested by the fact that their list of casualties to the latest recorded date, is, etc." Similarly the Great Western takes satisfaction in 10,000 employees with the colors; the Midland in 9,000; and the North Eastern in 6,200. These roads, in common with others, are making allowances to dependent families of their employees while under arms, and will find positions for them on their return to civil life.

Another vital human touch is the official announcement of the North Eastern, in its annual report, that in the bombardment of Scarborough, Whitby and the Hartlepools 5 employees were killed and 32 injured.

DINING CAR SERVICE.—The railroads that have dining car service have a growing incentive to make that service all that the traveler could desire. Gastronomic expectations can be fulfilled with greater happiness and disappointed with greater bitterness than any other. There are two things that must be gone about in the right spirit. A "kick" by a patron, no matter how made, may represent a substantial cause for complaint which may have been going on unspoken for a long time, for not every one exercises his right to complain. In order that complaints may always be turned to good account, the invitation that they be made to the conductor is important. Try to make the kicker speak to the conductor, not to the waiter, for the latter can see it only as an effort to defeat his right to a tip. The other point is the strictest care to serve only fresh, well-prepared foods. Don't say, when a robust, healthy man has a sudden attack of ptomaime poisoning, that it is a matter you can't get at. A legislator can't get at it, but a good caterer can.—*The Railroad Herald.*

THE GRETNA DISASTER

The wreck of three passenger trains at Gretna, Scotland, on the Caledonian Railway, May 22, reported briefly in the *Railway Age Gazette*, May 28, page 1130, resulted in the death of 161 persons and the injury of 200 others. Nineteen passenger cars and 12 freight cars were wrecked and destroyed by fire, and four locomotives were damaged beyond repair. The English papers bring some details of the causes of the collision. The second smash, which occurred within about one minute after the first one, is more properly to be classed as a derailment, the northbound express train on the west track, running into the wreckage of the first collision, which had occurred on the southbound (east) track. A considerable number of the victims were soldiers who had alighted from the southbound train and were walking or standing on the northbound track. They were unable to escape from the oncoming express train because of the presence of freight cars on a side track west of the main line.

The collision occurred at a signal box known as Quintinshill, about a mile north of Gretna station. A northbound local passenger train was set off on the southbound track to allow two express trains to pass it. These expresses, when on time, leave Carlisle, a few miles south, ahead of the local. The local train would have been put on a siding, but for the fact that there was much congestion because of Whitsun traffic and the movement of troops. While standing on the east track the local was run into by a troop train coming from the north, at full speed, both the distant and the home signals being clear for it. As before stated, the northbound train then came on at high speed before there was time to send out an adequate warning. Flames broke out within a very few minutes, either from coals which fell from the fireboxes of the locomotives or from ruptured gas pipes. There was some use of fire extinguishers, but the testimony concerning the fire is rather indefinite and somewhat contradictory.

The collision occurred about 6:40 a. m., just as the night signalman was going off duty, and some confusion in the giving of information by the night man to the day man, or misunderstanding on the part of the latter, appears to be one reason why signals were cleared for the southbound troop train when the northbound local passenger stood in its way. Mechan, the night man, regularly remained on duty until 6:30, instead of going off at six, according to the regulations; this in order to enable the day man, Tinsley, to reach the cabin by a convenient train from Gretna, the very train which was standing in front of the cabin and which was run into. This irregular habit was concealed from the inspectors; the night man made no entries on the train sheet after 6 o'clock, leaving a memorandum from which these were made by the day man.

In the reports thus far at hand nothing is said concerning the qualifications or experience of either of the signal men.

When a northbound train is thus standing at a station on a southbound track the rules require that the signal man put a collar on the levers of the signals, so that he cannot absentmindedly clear a signal for an approaching southbound train; but it appears that this use of the collar was habitually neglected.

The fireman of the local passenger train had gone into the cabin, and it was his duty to see that the collar was used, but this duty also was neglected.

A train of empty freight wagons, southbound, preceding the troop train had just arrived at Quintinshill, and had entered a side track. Whether the arrival of this train had been reported to the next station north appears to be in doubt; both the day man and the night man say that they did not make this report, which throws responsibility on Kirkpatrick, the block station next north; but the reports do not tell what happened there. The day man admits that he forgot all about the local passenger train, standing less than 100 ft. from his cabin. There was a freight train on a side track between the cabin and the main line which, however, does not appear to have formed a complete obstruction to his view of the passenger train.

The English papers refer to this disaster as the worst occurring on a railroad anywhere in the world since railroads were used, measuring, of course, by the number of persons killed and injured. So far as official records are concerned we have no facts at variance with this statement; but there was a wreck at Mailpois, Mexico, in June, 1881, which, according to the newspapers, resulted in the death of 214 persons and the injury of 50 others. A similar report from Santa Ana, Salvador, May 3, 1894, reported over 200 persons killed. A train wreck at Kobe, Japan, July 28, 1895, resulted, according to report, in 140 fatal injuries. In a train wreck at Maddur, India, September 24, 1897, the number of persons killed was reported as "five carloads." The longest death list in any train accident in the United States is that of the wreck at Eden, Colo., August 7, 1904, when a train broke through a bridge and 94 were killed.

RAILROAD LEGISLATION IN NEW YORK

The legislature of New York, recently adjourned, passed five laws affecting railroads, besides the items in appropriation bills for removing highway crossings. Senate bill No. 837, now chapter 281, amends the general law, section 52, requiring railroads to keep fences in good repair, by adding a clause including cattle guards, so as to make the railroad responsible for injuries to animals in case a cattle guard is not kept in good condition.

Senate bill 141, now chapter 240, amends the railroad law in relation to grade crossings by amending section 94, paragraph 7, so as to empower the Public Service Commission to authorize intermediate payments on an improvement taking a long time to carry out; and paragraph 8, requiring the legislature annually to appropriate $100,000 for paying the state's proportion of crossing changes, is cut out.

Senate bill No. 2112, now chapter 515, amends the banking law in relation to savings banks investments by an addition to paragraph *a* so as to make applicable to a consolidated road, like the New York Central, the provision requiring certain dividends to have been paid during the term of five years. In calculating the dividends all payments by all of the consolidating corporations may be included.

Chapter 559 amends the railroad law in relation to gates and flagmen at highway crossings, empowering the Public Service Commission to order the employment of a flagman or the erection of gates at any crossing where wayfarers on the highway cannot have a good view along the track when they come within 200 ft. of the crossing.

Chapter 564 empowers the Public Service Commission, on petition, to change the name of any railroad station.

A sixth law affecting railroads is that which gives the Public Service Commission authority over so-called "jitney bus" service in cities having less than one million population, the authority of the commission being made substantially the same as in the case of street railroads. The Long Island Railroad operates three trolley roads, and so is interested in this law. The company carries on this business without profit, for the general benefit of the people of Long Island. The law aims to prevent unfair competition on the part of automobiles with street cars.

The annual appropriation bill for the Public Service Commissions includes, for the elimination of highway grade crossings in the first district $200,000, and for the same purpose in the second district $552,000.

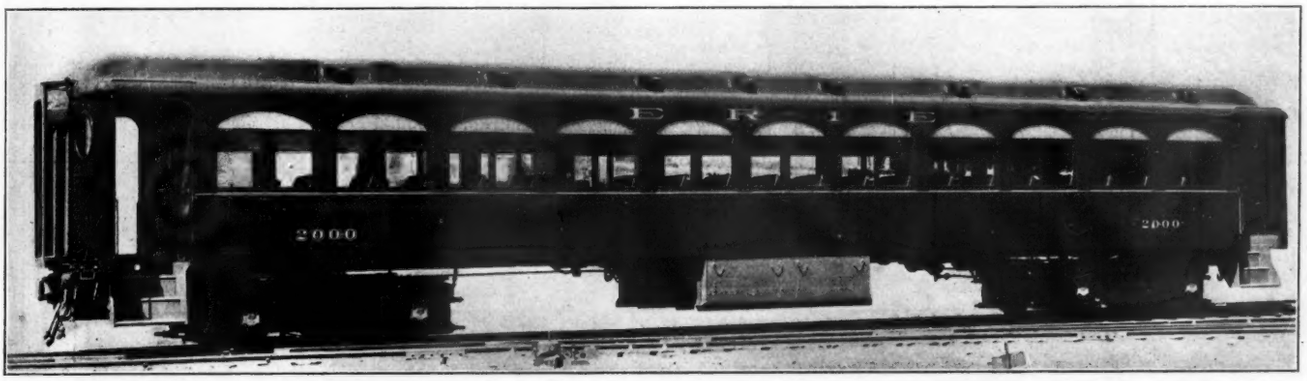
THE IRON CROSS.—The iron cross, the most highly-prized recognition of valor in the German army and navy, is not a casting, but is struck with steel dies in heavy coining presses. After being stamped out, the crosses are taken to the silversmith's, where the soldering is done, a fine silver border added, and the finishing completed. The silver border is polished on electrically-driven polishing and grinding motors.—*The Engineer.*

All-Steel Suburban Passenger Cars for the Erie

Coaches Have Seating Capacity of 86 and Are Exceptionally Light in Weight; Built for Future Electrification

A train of eight suburban passenger cars of all-steel construction, consisting of seven coaches and one combination baggage and smoker, has recently been placed in service by the Erie Railroad. The cars were built by the Pressed Steel Car Company, Pittsburgh, Pa., from designs prepared by L. B. Stillwell, consulting engineer, New York.

The design of these cars was made with a view to meeting the following conditions: Safety and comfort of passengers; low cost of operation; low cost of maintenance, and moderate first cost. In general their construction is similar to that of the New York, Westchester & Boston electric suburban cars, described and illustrated in the June 14, 1912, issue of the *Railway Age Gazette*, and while they are built for steam operation, provision has been made for the ultimate addition of electric motive power equipment. One of the points of greatest interest in the construction of these cars is the arrangement of the superstructure, whereby all parts contribute to its strength to withstand shocks of derailment, overturning or collision. Other notable features are the light weight per seated passenger and the easy-riding qualities which have developed in service.

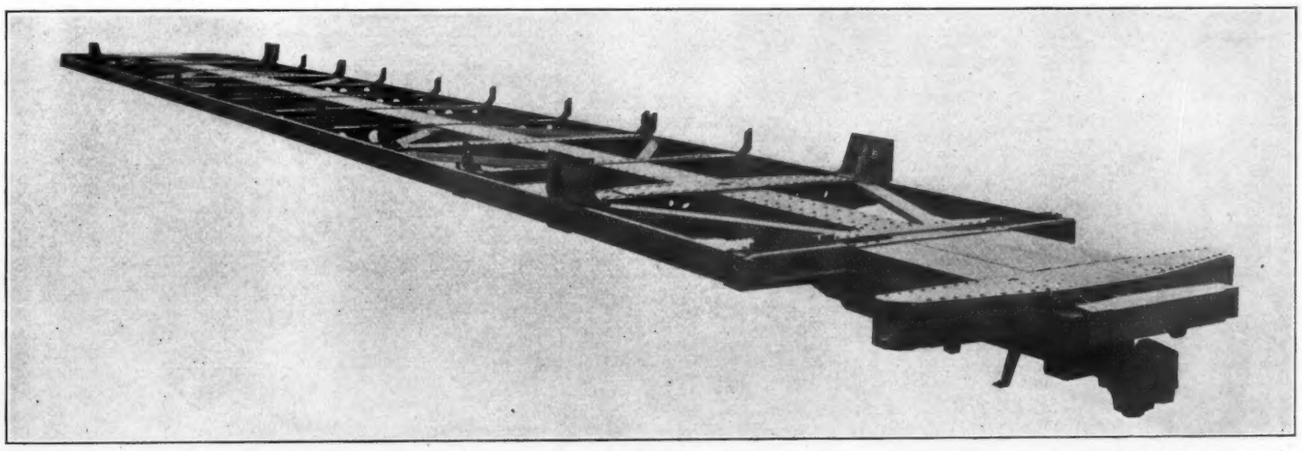


Erie All-Steel Suburban Coach

The coaches are 70 ft. 4 in. long over-all and weigh complete 95,400 lb. The table on page 1245 of comparative weights of Erie passenger equipment shows that the total weight is less than that of two classes of steel underframe passenger cars having a smaller seating capacity. It shows further that the all-steel car weighs less per seated passenger and closely approximates the weight per foot of over-all length, when compared with the lightest wooden cars in the same company's service.

The comparison per foot of over-all length is unaffected by the seat spacing, and is particularly interesting in this instance, as the new cars include heavy buffing and friction draft gears, as well as heavy draft sills, whereas the lightest wooden car has only the platforms and wooden draft sills with tandem spring draft gears. The light weight can be attributed to the exclusion of all unnecessary members. The deep and heavy center sill construction of the fishbelly type has been dispensed with, and sills of uniform section are supported by the deep side frame through a system of crossbearers.

Provisions for application of electric motive power equipment consist in the suitable height and outline of roof to permit of application of overhead current collector if required; the arrangement of vestibule for application of platform control equipment; the arrangement of underframe members for the support of electrical motive power equipment in the most advantageous manner for operation and for thorough inspection and maintenance of apparatus, and the design of draft sills, bolster and of truck whereby clearance is provided for electric motors.



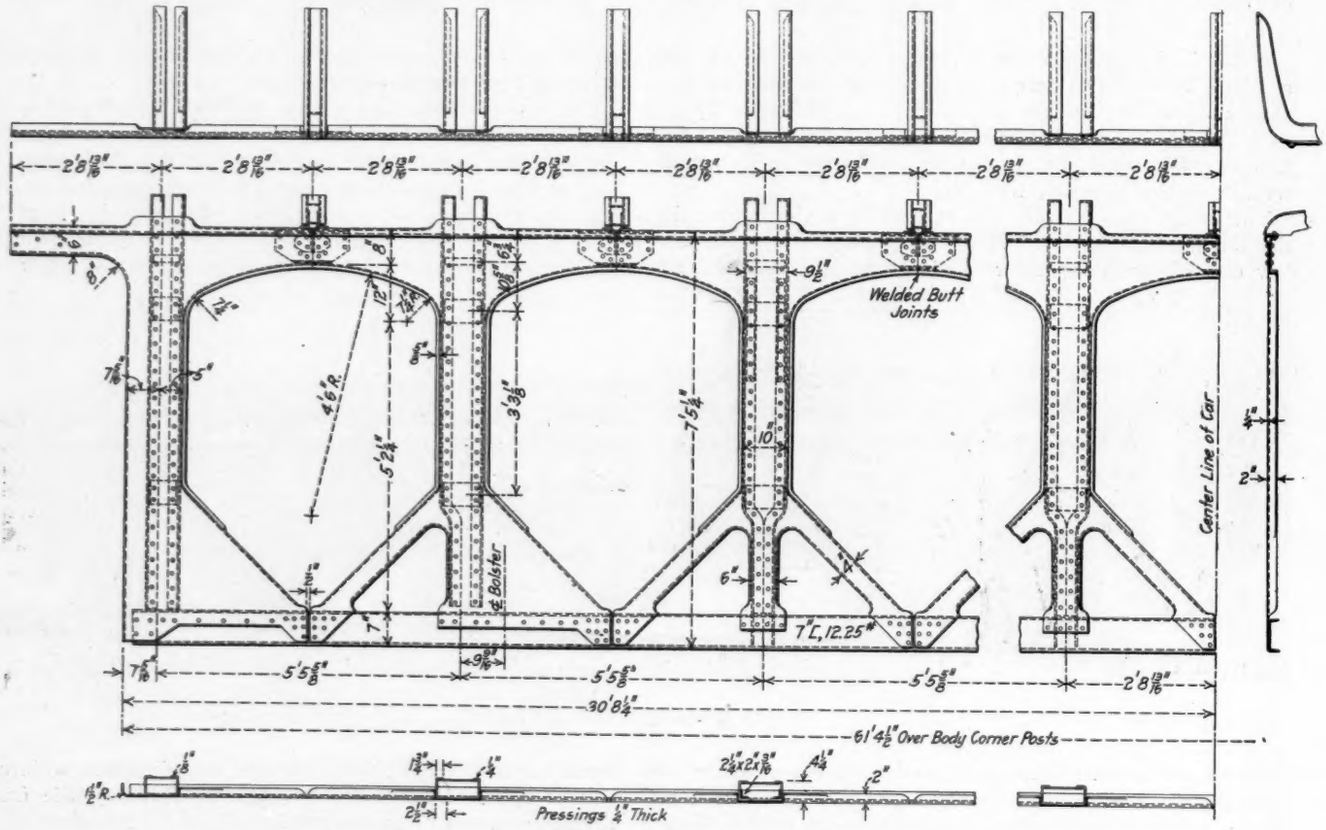
Underframe; Erie All-Steel Suburban Cars

The center sill construction of these cars is of uniform depth and section between bolsters, and consists of two 8-in. 16.25-lb. channels spaced 14 in. back to back, with a 19-in. by ⅜-in. top cover plate and two 4-in. by 3½-in. by ⅜-in. angles reinforcing the bottom flanges. This gives a total section of 22 sq. in. Forward of

the bolsters deep pressed steel draft sills extending through the bolsters reinforce the center sills and at the point of maximum depth add 10 sq. in. to the section.

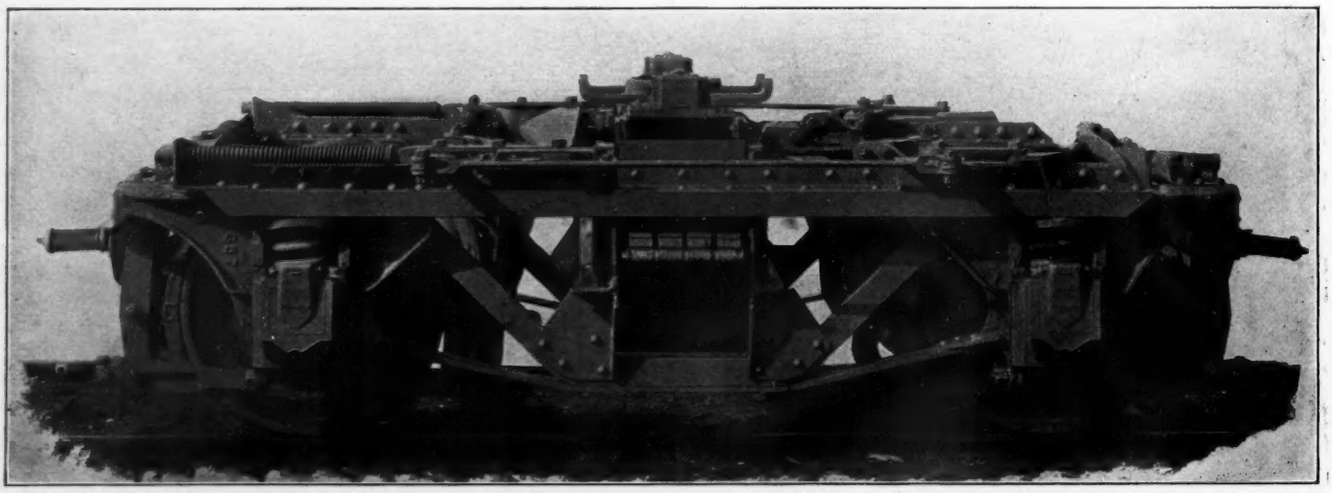
The center sill construction forward of the bolsters is supported by the high side frames through the body end sill and bulkhead construction. The bending moment occurring at this point due to the eccentric draft gear forces is resisted by the draft sills and is transferred by the body end sill and bulkhead construction to the high side frames. The center sill construction between bolsters is thus relieved of any eccentric loading from the draft gear forces, and the full section is available to resist the consequent direct compression because of the support afforded by the high side frames and heavy crossbearers placed under the side posts.

As the rigidity of an all-steel car underframe makes the use of a heavy draft gear practically imperative, and the installation of an effective buffing device equally necessary, the new Erie cars are fitted with a friction draft gear and buffing device calculated to be of sufficient capacity to absorb the most severe shocks received in service.



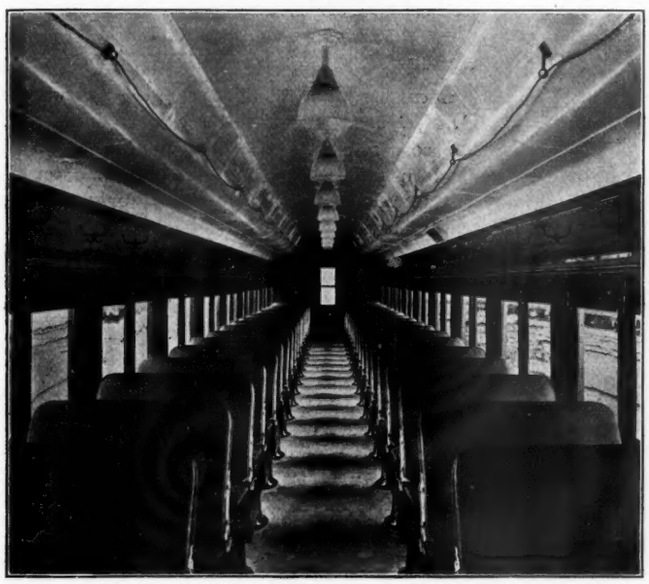
Pressed Steel Unit Side Frame Construction of the Erie Suburban Cars

The side frames of the car are 7 ft. 5¼ in. from bottom of sill to top of side plate, and are 61 ft. 4½ in. long over body corner posts. The entire frame is designed as a girder, with a pressed steel compression member at the side plate and a 7-in. 12.25-lb. channel tension member at the side sill. The posts connecting these members are of 10-in. pressed channel form, ¼ in. in thickness, and are spaced 5 ft. 5⅝ in. between centers. They are furnished with integral diagonal braces below the windows.



Truck Used on the Erie All-Steel Coaches

and with flanged gussets at the portal arches. The vestibule end posts consist of 9-in. I-beams framed into the sills and to the vestibule ceiling construction. The body end walls are fitted

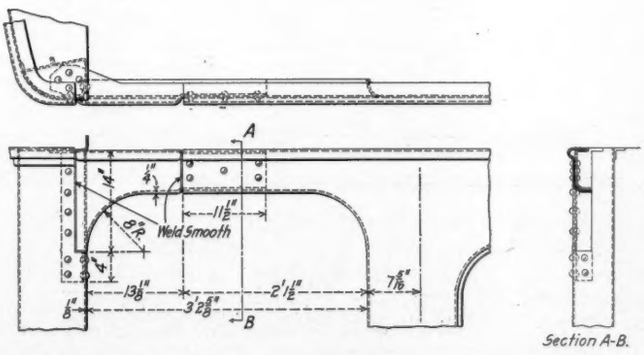


Interior of Erie Steel Suburban Coach

with ¼-in. pressed steel corner posts 12 in. deep, with gusset connections to the side sills and to the side plates of flanged form ¼in. thick, thus bracing the end walls against collapse.

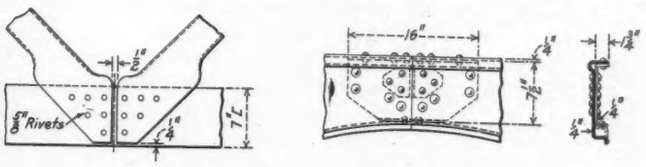
The roof structure is formed of pressed channel carlines, and is of the compound arch type. This form of roof is not only strong, light and inexpensive, but gives good ventilation good distribution of reflected light and is particularly suitable for the support of electric current collectors, should the cars later be fitted with electrical motive power equipment.

The trucks are 47 ft. 7½ in. apart from center to center and



Detail of Vestibule Corner Post Connection to Side Door Header

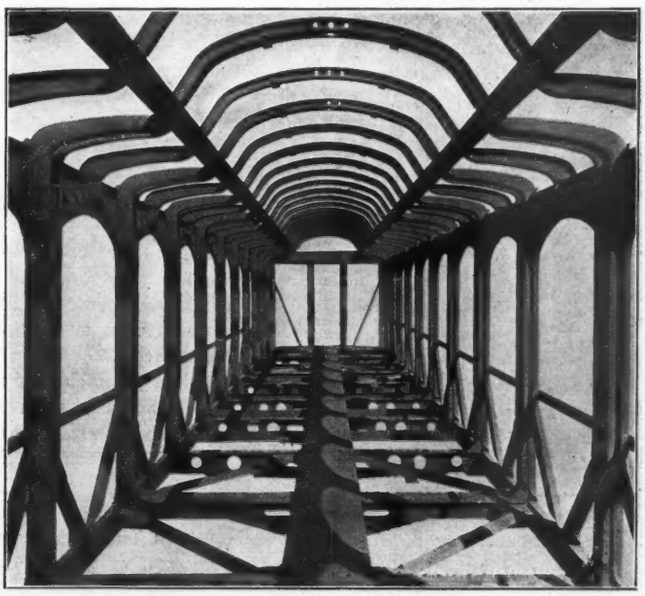
are of a non-equalized type, generally similar to those on the Westchester cars previously referred to. They are fitted with coil journal box springs and long quadruple elliptic springs under the bolsters. The proportioning of the springs is such as to produce the easy-riding qualities essential in steel car construction, not only for the comfort of the passengers but for the maintenance of equipment and roadbed. The trucks have an 8-ft. wheel base and complete, with clasp brakes and 33-in. wheels with 5-in. by 9-in. journals, weigh 12,500 lb. each. These trucks are designed with ample clearance for the application of electric motive power equipment, if at any future time their use in such service is required. Other features of interest on the trucks are Coleman bolster locking center pins which prevent the separation of car body from truck in case of derailment or collision, and



Details Showing Diagonal Brace Connection to Side Sill and Side Plate Splice

clasp brakes, which greatly reduce brake shoe and journal wear and facilitate smooth stops, which is an especially desirable feature in suburban service.

The illumination of these cars is secured by eleven electric fixtures arranged in center line of car, the form of ceiling outline being such as to reflect and distribute the light evenly over the seats and aisle without producing shadows. One 25-watt lamp is



Interior View of the Completed Framing; Erie Suburban Cars

used on each fixture. Power for lighting is furnished by a Wilson storage battery of 800 ampere hour capacity.

The equipment of the cars includes Miner friction draft gear and buffing device; Pitt couplers and Hale & Kilburn seats. Wherever renewals or maintenance require that a stock be kept on hand the railroad's standard parts have been used.

	New cars, all-steel	Class 1935-1950, steel underframe	Class 1910-1934, steel underframe	Class 1825-1874, wood	Class 1800-1824, wood
Number of seats	86	72	72	72	72
Average weight, lb	95,400	96,500	100,500	83,200	86,600
Weight per seated passenger, lb	1,100	1,340	1,400	1,140	1,200
Weight of lighting equipment, lb	Battery 8,000	Battery 8,000	Battery 8,000	Gas 2,000	Axle Gen. 6,500
Net weight of car, exclusive of lighting equipment	87,400	88,500	92,500	81,200	80,100
Weight per seated passenger, exclusive of lighting equipment	1,017	1,230	1,284	1,128	1,112
Length over-all	70 ft. 4 in.	66 ft. 3½ in.	66 ft. 3½ in.	66 ft. 3½ in.	66 ft. 3½ in.
Weight per ft. of over-all length, exclusive of lighting equipment	1,243	1,333	1,395	1,225	1,210

THE MEASUREMENT OF EFFICIENCY IN YARD OPERATION

By J. W. Roberts

General Superintendent of Passenger Transportation, Pennsylvania Lines West, Pittsburgh, Pa.

The results of efforts which may be directed toward the operation of terminal yards in accordance with appropriate efficiency standards, are affected either favorably or adversely by such a diversity of varying conditions that facts descriptive of the most minute details of the methods and practices of one yard, and apparently well adapted to its requirements, may not be accepted as conclusive evidence of a high standard of operation, but merely as one of numerous factors which enter into the formation of a correct measure of efficiency. Such results do not necessarily represent even the more prominent factors which a measure of terminal yard efficiency must embrace, but on the contrary owing to the wide range of view points as to the real functions of a terminal yard as part of a railway system, an achievement in the form of a comparatively low unit cost of operation at one point might in reality constitute the cause of legitimate criticism relative to unsatisfactory operation at other points because keen competition, irregular inbound and outbound train and interchange movements of cars, or inadequate car repair facilities and other like conditions may necessitate radical deviations from methods and practices calculated to produce a minimum unit cost of operation.

The classification of forces, assignment of shifting locomotives, selection of supervising assistants, and estimates of period appropriations, are all duties devolving upon the head of a terminal yard organization, which he cannot perform, correctly at least, in accordance with observations, but which demand reports descriptive of the exact situation in each part of the yard.

A very great variety of report and record forms have been designed to meet the three-fold requirement of measurement of service to be performed—measurement of member or unit capacity, and measurement of results obtained. Some of these forms doubtless serve the desired purpose, but as a principle it is safe to state that, to be most efficient, reports and records should be as brief and simple as possible consistent with the information they are expected to express, and should harmonize in all respects with the unit of service regardless of its character.

In the terminal yard this unit is the car, hence the current reports, records and permanent statistics should be based upon the *number of cars* handled in *each class of switching service* as illustrated by the accompanying report and record forms designated "A" and "B."

The reports and records relative to terminal yard operation which seem to be most popular among both large and small roads, are limited to information as to the *total* number of cars handled in and out of a terminal yard, including cars delivered to and received from connecting lines, and the direct operating expenses per car so handled. Such reports and records are fundamentally wrong and have no value as a gage of efficiency or proper unit expense. They do indicate whether the cost of handling a car varies within each of two corresponding periods when the business and other prevailing conditions generally are about the same, but the result when available is meaningless for the reason that within one period industrial switching service may have been very heavy, and through or interchange switching service very light; while within the other period involved by the comparison the directly opposite situation may have obtained. If reports and records do not meet the requirements of a single terminal yard, they can not possibly be employed to any advantage in connection with comparisons of the results of operations of different terminal yards of one railway system or of different railway systems.

The combination report and record forms "A" and "B" are designed to accommodate information showing the *total* number of cars handled by *each* switching crew in *each* of the four *distinct classes* of terminal yard service, and the total number of hours performed by *each* crew within a calendar day; the details specified and the total direct or the total direct and indirect expenses incidental to operations, constituting the measure of, (1) cost per car of all cars handled by each crew in each class of switching service within the limits of each district, and within the limits of the entire terminal yard; (2) cost of handling a car from the time it enters a terminal yard until it departs therefrom; (3) cost per car for the handling of cars to or from a particular industry or private track, and (4) causes of differences between items of cost referred to in sections (1) to (3) inclusive, as applied to different districts in the same terminal yard, to different terminal yards of a system, or to terminal yards of different systems.

Form "A" is intended to serve the three-fold purpose of a crew conductor's daily report of operations to his yardmaster, the yardmaster's daily report of district operations to the terminal yard organization head, and the basis for the maintenance of daily records on the form designated "B" by the crew conductor to measure operations under his immediate charge, the yardmaster to measure operations within the district under his immediate jurisdiction, and the terminal yard organization head to measure operations of the various branches or sub-departments of his organization.

FORM "A"

Report of Operation of { Switching Crew No... / District No..... } .....191...

Class of service	Number of cars handled	Number of loco. hours	Description of unusual conditions which affected operations
Passenger switching			
Classification (a)			
Switching (b)			
Interchange switching			
Industrial (c)			
Switching (d)			
Mine switching			

(a) Hump yard.
(b) General.
(c) Private industries.
(d) Freight houses, team tracks, repair tracks and other company tracks.

..... (Title of head.)

FORM "B"

Record of operation of ..... 191...

Date	Classification of switching service													
	Passenger		Classification: Hump yard		Classification: General		Interchange		Industrial: Private industries		Industrial: Freight houses, team tracks and other company tracks		Industrial: Mines	
	Cars	Hrs.	Cars	Hrs.	Cars	Hrs.	Cars	Hrs.	Cars	Hrs.	Cars	Hrs.	Cars	Hrs.
1														
2														
3														
4														
5														
6														

Note.—Record to be in book form so that the opposite page will in all cases indicate details of the corresponding day, week or month of the preceding year.

Both forms are in harmony with the theory that there is a unit in each class of service; that the supervisor over a service must know not only the capacity of his assistants, but the causes of variations in results of their efforts, and thus be in position to direct adjustments in forces and expenses immediately after conditions warranting that action become apparent; that the exhibited comparative results of member, branch or sub-department, and department operations are an essential part of a system of educating employees and creating interest in their work;

and that a terminal-yard organization head should be prepared at any time to make a very close estimate of the cost per car of all cars handled in each of the different classes of switching service; in any one of the classes of switching service, or to or from a particular industry or private siding. The latter detail is one which is very closely related to the service of "spotting cars," while the measure of switching cost is certainly the *right measure* also of the switching rates.

The four different classes of switching service as indicated are common to all terminal yards, which is likewise true of certain of the subdivisions of classes two and four as indicated. The classes which represent the movements of cars to and from mines, the handling of passenger cars, and classification through hump yards, are not common to all terminal yards, and since refinements with respect to cost more extensive than the four distinct classes of service might be required, the record and report forms provide for them.

A very natural criticism of the report and record forms referred to is that their use will entail considerable labor on the part of the supervising heads, in which criticism advocates of the theory that efficiency may be obtained without supervision other than observations will readily concur; the other side of the same proposition being that economical operations demand interest and efforts of employees to the extent of reliable current measurements of accomplishments, and that the results warrant the little additional labor necessary to obtain them. Inasmuch as the performance to be reported and recorded refers to *totals* in all cases, a loyal head of a branch or sub-department, informed as to the purpose of the reports and records in their relationship to his personal service and standing, should resent instructions prohibiting him from giving in that form evidence of his relative capacity, worth, and rights when the opportunities for advancement are presented. Furthermore, to maintain the records, which would be neither difficult nor expensive as proven by experiments in a large terminal yard, would be to anticipate requirements in the nature of measures for: (1) Switching rates sufficiently large to yield a fair profit, and represent a proportion of through transportation rates; (2) charges sufficient to cover the cost of handling carload shipments between loading or unloading points on private sidings, and reasonable distance limits from stations to or from which transportation rates apply; (3) charges representing at least the cost of switching and handling of cars at different points incidental to reshipments, reconsignments, etc., as authorized by published tariffs.

OVERHEAD CHARGES IN VALUATION

By Richard Hoadley Tingley

The scrap-heap, into which is thrown all items of construction expense that cannot find lodging in any other classification, is commonly known as the "Overhead." There are almost as many different ideas as to the make-up of this classification, and the value of the units that go into it, as there are commissions having to do with it. The truth of the matter is that the term "Overhead" has no clearly defined, well recognized definition; no really official standing in valuation nomenclature. The official classification of the Interstate Commerce Commission does not mention this term, but provides for "General Expenditures," into which must be placed all items of expense not specially mentioned as belonging elsewhere. Nevertheless, the term overhead has come into such general use; is so often spoken of and written about when reference is made to the valuation scrap-heap, and has occupied such an important position in the decisions of courts and commissions, that a brief study of its real meaning and significance may be instructive.

In the broadest acceptance of the term, overhead charges include: Engineering and superintendence, contingences, contractors' profit, promotion costs, bond discount, piecemeal construction, brokerage and general expenditures.

In this last item, which is recognized as one of the three grand sub-divisions of construction accounting by the Interstate Commerce Commission, is included further overhead items as follows: Organization expenses, general officers and clerks, law, stationery and printing, taxes during construction, interest during construction and other general expenses. To these may be added two more items which, although not fully recognized by commissions generally, are really members of the overhead family in certain classes of valuation, development costs, going value and franchise value.

There is no uniformity among the different commissions as to the acceptance or rejection of the above items, each choosing its own course irrespective of others.

Not only in the matter of looseness of definition is overhead noticeable. It is the weak point in valuations today; the feature about which the least amount of definite knowledge exists. Other elements of value have been and are being accurately determined. Inventories of visible assets have been and are being made with great care and scrupulous nicety. Land values have been and are being scrutinized by experts, and courts are deliberating and ruling on whether or not the unearned increment represented thereby shall be allowed as value. The subject of depreciation is being widely discussed with a view to ascertaining what place, if any, it has in valuations for rate making or other purposes, yet, except in a few cases of appraisal of water works properties, it is apparent that overhead has so far received no really careful study; no attention to compare in any way with the thought that has been given to other elements of value. Its importance warrants better treatment.

Professor M. E. Cooley says in the Journal of the American Electric Railway Association, 1911: "Depending on the locality, and whether certain of the items discussed may or may not be included in the cost without being separately stated, the total overhead charges may vary from 20 to 25 per cent, and from 50 to 60 per cent, of the cost as determined by inventory; that is to say, the total cost of the property will vary from 120 or 125 per cent to 150 or 160 per cent of the cost as determined by inventory of the physical elements alone." In this Professor Cooley writes from general knowledge only, and it must be admitted that the range is wide indeed. It is true, however, that such a range exists, though perhaps Professor Cooley has overdrawn it. Moreover, the determination of whether 20 per cent or 60 per cent of the inventory cost shall be added to appraisals is little better than one man's judgment as against another's, for no better information exists, and one expert's judgment, estimate or guess is as good as another's.

In an arbitrary manner the different state commissions have adopted certain percentages to be added to inventory costs to cover overhead. In practically no case does the determination of these percentages rest on a solid basis. In each case it is an assumed basis resting on general knowledge and a limited amount of actual data.

Many state commissions do not recognize development costs or going value as elements in valuations, and many, too, give no room as such to contractor's profit, contingences, etc., reasoning that in inventory costs these latter items have already been taken care of. If, however, full consideration is given in valuations to development costs, a much wider range of possible percentages to be applied to overhead will appear than that brought out by Professor Cooley. A lack of understanding as to what is included under this heading is responsible in some measure for the situation, and some distinction is made with respect to the purposes of the valuation. In several cases of valuation for purchase and sale the courts have upheld an addition of from 10 to 25 per cent to the inventory cost to cover going value, but in rate cases there has been a tendency to exclude this feature as well as development costs. The Wisconsin Commission usually gives full recognition to development costs, and in certain rate cases has allowed as high as 20 per cent of the cost of reproduction. L. R. Nash says in Stone and Webster Public Service Journal for October, 1912: "It will be of interest to consider the aggregate of all overhead costs as

compared with structural cost. The successive addition of percentages applying to physical property gives a cost of reproduction from 129 per ent to 158 per cent of the structural cost. The further addition of percentages connected with the organization of the company gives totals of 131 per cent to 163 per cent of the structural cost. The final addition of percentages to cover development costs gives an undepreciated fair value from 141 per cent to 188 per cent of the structural cost. It thus appears that it is by no means inconceivable that such fair value in certain cases may be double the structural cost, if development costs are considered."

Robert H. Whitten says in his Valuation of Public Service Corporations: "The trouble with overhead is that nobody has yet taken the pains to study it, and that there is no uniformity of practice in the different states and commissions as to what items go to make up its total. In giving testimony the experts on behalf of both sides freely admit that they have no definite knowledge of the subject nor of the figures they are presenting to cover overhead. In summing up valuation cases and in rendering opinions, commissioners also are equally free in acknowledging their ignorance, and in stating that 'general knowledge' rather than definite and precise information governs." In reviewing opinions and findings of commissioners one frequently finds such references as the following: In the Public Service Commission of New York, First District, opinion and order of commission, October 20, 1911, Mayhew vs. Kings County Lighting Company: "It might be expected that the company itself would have data on which to base an estimate of a reasonable allowance for these terms (overhead). In this case the company has produced no such data. A request was made for the early records of the Kings County Gas & Illuminating Company, the predecessor of the present company, but they were not presented. An estimate must therefore be based upon general knowledge and experience." The theoretical figures of the company were then discussed, and the opinion goes on to say: "In the absence of data as to actual expenditures by the company, this amount is considered generous, probably too large." Again, in an opinion of the Los Angeles Board of Public Utilities is found: "The usual 20 per cent of cost, to cover engineering, supervision, interest and contingencies during construction," was allowed.

It seems to be apparent that in most cases a company should be able to substantiate its claims for overhead allowances by actual vouchers and other records of such expenses incurred in the construction of the property. There is no necessity for leaving this important matter entirely to expert opinion as to such costs, based on hypothetical conditions of assumed reconstruction. Suppose, for instance, that in the federal valuation of the railroads now in progress the matter was allowed to remain in its present chaotic state. The Interstate Commerce Commission, contending probably for low values, at least not for high ones, might be 10 per cent, or even 20 per cent, apart from the overhead value determined by the railroads, and in a total figure represented by many billions of dollars such a discrepancy would be serious indeed, and each faction would have as clear a title to its opinion as the other. Such a difference would render worthless all the carefully prepared inventories of visible assets, and would throw into disrepute the entire valuation matter. Its enormous expense would have been of no practical value. It would be like straining at a gnat and swallowing a camel.

The remedy for the troubles in overhead is quite clear. The National Association of State Railroad Commissioners has produced much valuable data bearing on valuation practice generally, in the different states. It might well occupy itself in defining the meaning and scope of overhead, and in determining and agreeing upon just what items of expense properly belong to this classification in valuations for the different purposes, rate adjusting, taxation, capitalization, purchase. This would insure at least uniformity. Furthermore, the state commissions, the Interstate Commerce Commission, and the various committees from the railroads might, and eventually must, occupy themselves, either jointly in one grand committee or separately, each for itself, in solving the greater overhead question; that of fixing upon a series of percentages that can safely be added to inventory costs to cover the various types of cases that present themselves in valuations. This field has never yet been covered. An organized search by experts of the books, accounts, histories and records of the railroads and utilities plants under review would be productive of illuminating results, and by covering a very large field, as in the case of the federal valuation of the railroads, and by carefully analyzing and tabulating results, a series of percentages could be arrived at that would mean something. As the matter now stands, a series of arbitrary percentages are applied to inventory costs to determine the overhead that mean little or nothing; somebody's opinion. As it might be worked out by the plan I have suggested, actual costs of overhead could be determined in a sufficient number of cases, so that the reverse would be the case: actual figures would then govern percentages. Such well digested and authenticated percentages could then be applied to plants and properties where no record exists, and where etsimates must of necessity prevail.

A NEW LUNCH COUNTER CAR

The Chicago & North Western on June 5 put in service a lunch counter car in connection with its "Golf Special" train, which leaves the Chicago passenger terminal daily, except Sunday, at 12:20 p. m., and reaches nearly a score of golf clubs located along its line on the north shore between Chicago and Waukegan. Returning the train reaches Chicago at 7 p. m.

Interior of the Lunch Counter Car

The car will be ready to serve a high grade lunch at popular prices at 12 noon, 20 minutes before the leaving time of the train, and thus will be a great convenience to the patrons of this train. The car contains a lunch counter running lengthwise of the train and occupying the entire length of the car, except for a short kitchen at one end. Seats are provided for 27 persons.

Signals on the Victoria Railways.—On the Victoria government railways 74.49 per cent of the stations, junctions and siding connections are interlocked. During the year ended June 30, 1914, fifty new electric train staff sections were brought into use and thirty-two tablet sections were replaced by the electrical train staff.

The Mechanical, Purchasing and Stores Departments*

Relations Between These Three Departments. Organization Necessary to Get Both Economy and Co-operation

By H. C. Pearce
General Purchasing Agent, Seaboard Air Line

There should be no division of responsibility between the purchasing and stores departments. These departments are logically one, and should more properly be termed the "Supply Department."

Our maintenance departments are organized and maintained primarily for the purpose of maintaining the equipment and roadway and structures in the best possible physical condition. Their unit of measure is the condition of the equipment and permanent way. They are not vitally interested in the investment for materials, or in any of the problems of purchasing, storing, distributing and accounting.

The supply department is organized for the purpose of providing, caring for, delivering and accounting for materials, and the assembling and disposing of the salvage. Its unit of measure is its ability to provide suitable materials promptly for the work at the lowest cost, and with the smallest permanent investment.

By a careful analysis, it will be found that the real cause of the unsatisfactory conditions which have prevailed, generally, is due to imperfect organization and supervision. The supply department should be so organized that it knows with reasonable accuracy what material will be needed, what quality is best suited for the work, and be in position to provide it promptly to the users when needed; recover and reclaim everything possible for re-issue, and market the salvage to the best advantage. In order to do this, there must be a well defined, practical plan, proper facilities and a sufficient number of trained men to handle the work. It is not expensive buildings and supply depots that are needed so much as sufficient room to properly segregate the material and protect it from the elements; facilities for handling and delivering economically, and, above all, a well trained organization that is in position to anticipate the requirements and provide for them in the shortest possible time, with the least expense, and with the smallest amount of material on hand.

The store delivery system, properly installed and supervised, offers the only practical way of keeping in touch with the actual needs and is the only economical method of delivering materials to the users in shops. The plan has as its basis a store delivery foreman with sufficient messenger boys and men to place the material in the hands of the users as wanted, and the bringing back to the storehouse of repaired and manufactured articles. The foreman in charge of this work should be a thoroughly competent man and be in close touch with the foremen of the different departments at all times. The messengers and delivery-men, by being in actual personal touch with the users of the material, become efficient and useful. The foremen and mechanics are able to confine themselves to the actual work at hand, thus saving the present loss of time of mechanics and helpers going back and forth from the storehouse for material, loss of the use of machinery, etc.; but, above all, it places the supply in touch with the actual needs

The supply train offers the only practical means of knowing what is needed for ordinary maintenance on the line, and is the most economical method of delivering material and collecting the salvage. The plan consists in moving the necessary supplies for all ordinary maintenance and operation on a regular schedule. The material and supplies in this train are so arranged that they can be issued in the least possible time. The crew consists of a supply car storekeeper and the necessary help or helpers to unload and deliver to the agents, telegraph officers, pumpers, section foremen, signal maintainers, etc., such material and supplies as will be needed to last until the next regular schedule of the train, after a thorough check has been made of what is actually on hand.

This train picks up all surplus material which may have been collected for any reason, materials and tools which can be reclaimed and repaired, and the scrap or salvage. It should be accompanied by the division engineers, roadmasters, and, whenever possible, by the superintendents. It will be found to be the most practical way of making a careful inspection of conditions by division officers. On railroads, districts, or divisions where the amount of supplies required does not make up a full train, dead-empties and loads can be moved to make up the tonnage. Engines moving light can be used to handle this train to advantage. The schedule should be prepared with this object in view. On railroads, districts, or divisions where these cars can be operated in locals during daylight, there is no objection to so doing, but the full usefulness of this train cannot be obtained unless it is operated properly.

These two branches of the service are fundamental to any efficient supply organization.

The organization should be such that the requisitions will be prepared so that they will go to the purchasing agent complete in every detail. The purchasing agent should so organize his office that only in exceptional cases should it be necessary to secure bids after the requisitions are received. In the majority of cases, agreements and contracts can be made to cover all standard supplies so that the orders can be placed immediately for most standard materials. It should not even be necessary to rewrite the orders. They should be made up complete at the time the requisition is prepared in the general storekeeper's office. Every day consumed from the time the requisition is prepared until the order is placed is time lost, without any contributing advantage. For the same reason the purchasing power should be used to its fullest extent to procure regular and uniform deliveries.

The maintenance departments should combine their technical knowledge and experience in the preparation of the specifications and standards. Probably no one thing is so badly needed on most of our railroads as carefully prepared, practical specifications and inspection. The specifications, when drawn, should combine the best practice and experience of the maintenance officers of our railroads, as well as the manufacturers.

Specifications, like organizations, should be flexible enough and broad enough to meet all conditions. Specifications are essential for the economical purchase and supply of materials. Specifications offer many advantages: They enable the manufacturers to produce their products at the lowest cost and place them in position to regulate their purchases of raw material and systematize their organizations so as to greatly reduce the costs and furnish better and more uniform material. They enable the supply department to arrange for its source of supply in advance and obtain it regularly. It is the only fair way to purchase materials, as it places all manufacturers on an equal basis.

Specifications, to be useful, must be prepared on the basis of service performed. Our chief engineers, mechanical engineers and engineers of permanent way have an opportunity to procure very valuable service records which should be

*From a paper read at the March meeting of the Southern and Southwestern Railway Club.

incorporated into the specifications, which will be of the greatest service to the purchasing officer in arranging for materials.

Inspection is of fundamental importance, and should be thorough and complete. Material purchased to specifications and drawings should be inspected by the mechanical engineer or engineer of tests, and a certificate issued before it is accepted. Other material can be given a practical inspection by the section storekeeper who receives it. These men must be practical men and thoroughly informed regarding the materials for which they are responsible. Their knowledge of the purpose for which the material was ordered, and the purpose for which it is used, enables them to make a practical and useful inspection at the time they check it for quantity.

The manufacturing and repair departments of our railroads should be required to give as good service as any outside industry, and should be held responsible for regular and prompt deliveries. Proper regulation and supervision of this branch of the service will give great relief to the supply department and overcome many of the present complaints. This is particularly true of repair work, which is generally not given proper consideration. The manufacturing and repair departments on our railroads should be operated for the benefit of the railroad as a whole, and not for a particular department.

The maintaining of standards is of the greatest importance. Standards should not be so rigid as to destroy their usefulness, but they should not be changed until the benefits can be shown to fully offset all of the expenditures incidental to the change. A standing committee on standards, consisting of the chief maintenance, construction and supply officers, to which should be referred all recommendations for change in standards, will be found of great assistance and of practical value. The chief supply officer is conversant with manufacturers' standards, markets and other matters which would be of use to the committee. In addition to passing on standards, this committee could direct the preparation of specifications, arrange for the use of surplus and obsolete material, either for application to the company's requirements or by exchange agreements with the manufacturers.

All matters referred to in this paper apply equally to the maintenance of way as well as the maintenance of equipment department. There is a disposition on some railways for the maintenance of way department to consider its operations such that it should handle its own material, while the maintenance of equipment department, for some reason, is inclined to believe it should be the custodian of the stores.

In conclusion, from a broad viewpoint, the relations which should exist between these departments is one of useful, intelligent co-ordination. It may be truly said that the best organization is the one that requires each department to thoroughly understand its responsibilities and perform its duties, and I am firmly of the opinion that the relation between the mechanical, purchasing and stores departments on our railroads will be best improved and more efficiently administered by having each of these departments carry out every day the details of their organization in a careful and thorough manner, supervised by broad and experienced officers. The truest co-operation is that which comes from respect.

Design of Steam Piping.—Correctly designed steam lines skillfully erected are no more likely to fail and interrupt the service than other features, not duplicated. It is a matter of common experience that the hydraulic piping in a plant causes less trouble than the low-pressure house-service piping, because of the difference in installation. The same is applicable to steam piping.—*Power.*

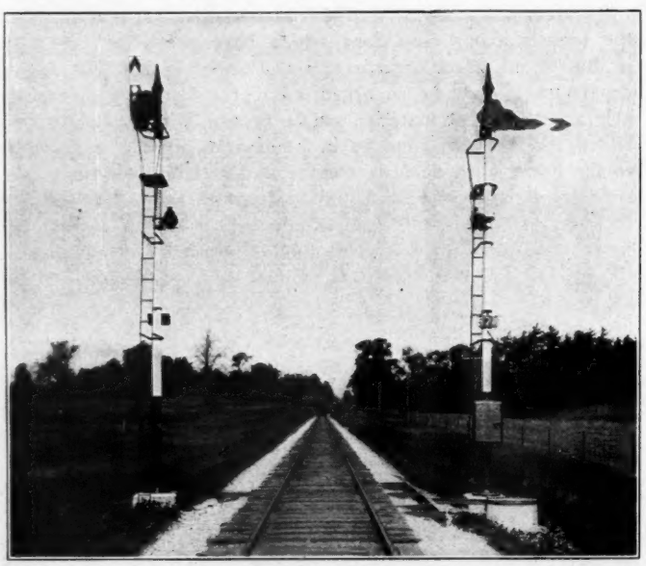
SINGLE-TRACK AUTOMATIC SIGNALS ON TORONTO, HAMILTON & BUFFALO

During the summer of 1911 the Toronto, Hamilton & Buffalo began its first automatic block signal installation on a short stretch of track, nine miles long, from Kinnear, Ont., to Vinemount. In 1913 this signaling was extended from Vinemount eastward to Welland, a distance of 26 miles, and in 1914 signals were installed on the west end from Hamilton to Brantford, a distance of 25 miles. There remains approximately 16 miles of single track between Brantford and Waterford which is not equipped with automatic block signals.

As shown in the accompanying map, the T., H. & B. forms a connection between the New York Central Lines on the south and the Canadian Pacific on the north. The traffic is heavy, the average being 32 trains a day, and the maximum 52 trains a day, as follows:

	Average.	Maximum.
Freight westward	6	10
Passenger westward	10	16
Freight eastward	6	10
Passenger eastward	10	16
Total	32	52

Trains were formerly operated by the telegraph block system in connection with train-order boards, and in some cases by



Double Signal Location Between Cainsville and Jerseyville

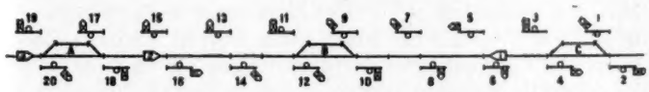
standard semaphore train-order signals. Trains following a passenger train were held at train-order stations until the passenger train was clear of the block, and a time interval of five minutes was maintained at train-order stations between following freight trains. Train orders and instructions regarding train movements are transmitted by telephone, and there is a telephone at each passing siding so that trainmen can communicate direct with the despatcher when occasion requires.

The system of signaling is the General Railway Signal Company's absolute permissive block, in which the block for opposing trains is from siding to siding, and for following trains from signal to signal as in double-track signaling. Signals governing movements from passing sidings into adjoining blocks are in all cases absolute, and, when in the stop position, must not be passed, as the block may be occupied by an opposing train. Signals governing trains approaching the siding are permissive, and, when in the stop position, may be passed after a stop has been made in accordance with the rules. Intermediate signals are permissive. Ordinarily there are two or three pairs of intermediate signals between passing sidings, but in some cases there is only one pair, in which case the intermediate signals are staggered in order to provide an adequate margin of safety if a train

should disregard an absolute stop indication and enter a block occupied by an opposing train.

The diagram herewith shows opposing trains 1 and 2 approaching a meeting point at siding B, and illustrates one of the important features of this system, the double distant or caution indication, signals 7 and 9, and signals 12 and 14, which affords maximum safety at meeting points, and insures proper signal indications. Owing to the arrangement of the control circuits it would be practically impossible for train 1 to pass signal 7 at clear and then find signal 9 at stop, or for train 2 to pass signal 14 at clear and then find signal 12 at stop. Absolute signals 10 and 11 protect against opposing trains.

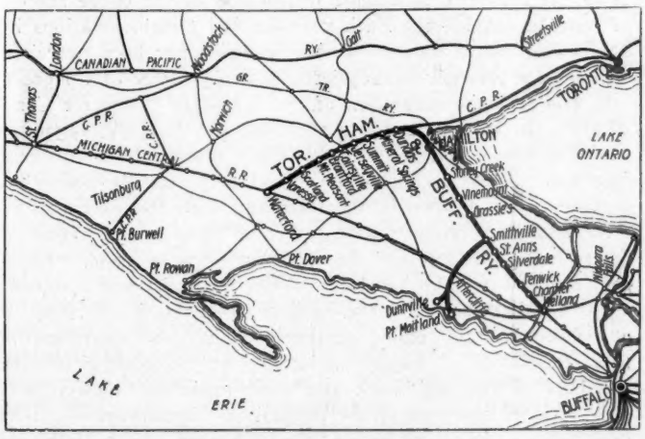
Intermediate switches are, in most cases, equipped with push-button indicators of the semaphore type and normally indicate that the block is not clear. Before opening the main line switch, trainmen are required by rule to press the push button; if con-



A. P. B. Signal System on T. H. & B. Showing Two Trains Approaching a Meeting Point

ditions are such that it would be safe to enter the main track, the indicator blade operates to the vertical position and indicates that the block is clear. If the block is not clear, the indicator blade remains in the normal position. This arrangement of de-energized switch indicators reduces to a minimum the chance of false clear indications. The push button operates two contacts which make and break both sides of the energizing circuit. The resistance of the indicators is 690 ohms. Main line switches are equipped with model 5 switch-circuit controllers through which, in some cases, the control circuits are broken, and, in other cases, the track circuits are shunted.

Absolute signals are distinguished by a square-end red blade and by a red marker light below and in the same vertical plane as the active light. Permissive signals are distinguished by a pointed-end red blade and by a red marker light below and to



T. H. & B. Single Track Line Recently Equipped with Automatic Block Signals

the left of the active light. The roundels are R. S. A. standard, the colors being red for stop, yellow for caution and green for clear. The automatic signals are numbered according to their mile-post locations. The top and bottom parts of the signal masts and fittings are painted black, and the intermediate part white, making a conspicuous signal which stands out clearly against the usual backgrounds. Semaphore lamps are R. S. A. standard and are equipped with long-time oil burners.

The railway company furnished and installed in place insulated joints, insulated switch rods and connections and line-wire supports, and the General Railway Signal Company manufactured and installed the signals and signal appliances. R. L. Latham, chief engineer of the Toronto, Hamilton & Buffalo, had general charge of the installation, which was performed under the immediate supervision of A. A. Hurst, supervisor of signals.

Suitable rules governing the use of the automatic signals were adopted by the railway officers, and were printed in the back of the employees' time table with the operating rules. About the time the signals were ready for service, the railway officers held several meetings for instruction of the trainmen at Hamilton, the division headquarters, at which the signal aspects and indications were elucidated and discussed, as were also the rules governing their use. At these meetings lantern slides of the signal aspects and indications were thrown on a screen to illustrate the explanations, and a model 2-A signal mounted on a short mast, an indicator, a switch-circuit controller and other signaling appliances were operated as if under service conditions to afford a practical demonstration of the signal system and to fix the essential features firmly in the minds of employees.

The maintenance of these signals is in charge of a signal supervisor whose force consists of two maintainers, four battery men and two lampmen, who make a daily inspection of the signals and appliances on their respective districts. Each man is provided with a velocipede car on which he carries the necessary maintenance supplies and a kit of tools. Improper operations of the signal system are reported by the maintainer by joint wire to the chief engineer, the superintendent and the signal supervisor. Copies of the report are forwarded by railroad mail to the signal supervisor with full explanation of the cause. The signal supervisor investigates each case personally and works up a record which shows the performance of the entire signal system month by month.

The signal supervisor also keeps an accurate record of all labor and material chargeable to signal maintenance, so that maintenance costs can be determined for the entire system or any part thereof. The cost of maintenance per mile per month is about $16. Ordinary maintenance supplies are carried in stock at the general storehouse situated at Hamilton, and a few emergency supplies are kept on hand at maintainers' headquarters.

The officers of the T., H. & B. are well satisfied with the results obtained by the automatic signals, summarized as follows: (1) Under proper observance of the indications, the signals provide for opposing, as well as following movements, a definite space interval which reduces the likelihood of collisions to a minimum; (2) misplaced switches, broken rails, or any breaks in the continuity of the track cause the display of a stop indication at the signal governing entrance to the block, thus greatly reducing the likelihood of derailments; (3) the signals increase the traffic capacity of the line, as one train can follow another as soon as the first train passes the signal in advance, which is accomplished in considerably less time than the prescribed time interval of the telegraph block; (4) the signals afford maximum protection at meeting and passing points, serving as a check on despatchers' orders, also as a reminder to trainmen at scheduled meeting and passing points; (5) the signals more than double the safety factor in connection with flagging, as an approaching train would, in most cases, meet a caution or stop indication before the flagman could go out far enough to insure adequate protection; (6) owing to the high degree of protection which the automatic signals afford, "19" orders may be used in many cases where "31" orders would otherwise be required.

CRUDE OIL.—California's crude oil production in 1914 was 103,623,695 barrels, as compared with 97,867,147 barrels in 1913.—*Power.*

CAB SIGNALS IN ENGLAND.—Among the English railway companies which are known to have commenced experimenting with locomotive cab signals are the Lancashire & Yorkshire, the Great Central, and the South-Eastern & Chatham. The Great Western and North Eastern have them in regular use, and the Midland has been trying two systems for some time.

THE STATE AND THE RAILROADS*

By H. R. Kurrie
President of the Chicago, Indianapolis & Louisville

Entirely apart from the question of the legal duty of the state is the question of the best interest of the state. I maintain that no state can afford to gain the reputation, among men of large means, as being one that will add burdens to already overburdened existing investments without careful inquiry disclosing conditions which will appeal to any reasonable mind as justifying the increased burden.

Now, what has happened in the state of Indiana in the last 10 years relating to railway properties? In the first place, and without fear of contradiction, I make the statement (aside from the law limiting free transportation) the state has not done one single thing which will increase the revenues of the railway companies or reduce the expenses of doing business. Everything that the state has done has been in the way of adding a burden to an already over-burdened investment. In the year 1905 the law commonly known as the "railroad commission" or "public utilities law" was passed. Without going into detail, it is sufficient to say that this law brought improved methods of doing business at a substantially increased cost. In the same year, laws were passed which authorized certain cities to require track elevation. Track elevation means a very large outlay with no increased return, and while in many cases the condition justifies the separation of grades, yet the point which I am making is that the effect of the law was to add materially to the railroad expense in the state of Indiana. In 1907 a law was passed which materially reduced the charge of railway companies for handling excess baggage. A law was also passed limiting the hours during which the employees could be kept on duty. A law, commonly known as a "full train crew law," was passed. On the heels of this law the legislature passed a law requiring railroads to equip their lines with automatic block signals. This is the best known method of spacing trains, and avoiding collisions, and it also gives warning of a broken rail, an open switch, or any other track condition which imperils the advancing train, and in every case it gives warning in ample time. It is a silent sentinel, Argus-eyed, ever watchful and unfailing. The flagman is a duplication in a most crude and inefficient way of this protection. The crowning effort of 1907 was the enactment of the two-cent fare law. This was a horizontal reduction of 33⅓ per cent in the passenger fare. The legislature passed this law without any investigation of the value of these investments or whether the return at the time enjoyed was excessive. It was a sort of climax to an avalanche of hostile legislation which was directed at this form of investment—a frenzy in which the desire to apply the lash was much more in evidence than a sense of fair dealing.

It is a common impression now that when the fare was reduced from three cents to two cents, increased travel resulted, so as not only to overcome the apparent loss, but actually to make the two-cent fare more profitable to the railroads than the three-cent fare. On the Monon this is what actually happened: In the year 1908, which was the first year of the two-cent law in Indiana, the actual cash receipts were $103,000 less than in the last year under the three-cent law, while the passengers carried one mile increased in 1908—1,200,000. In other words, this increased service was rendered for $100,000 less money. In 1909 there was an increase of 4,500,000 in passengers carried one mile, while the revenues were $83,000 less than the last year of the three-cent law. In 1910 the receipts were $17,000 more than in the last year of the three-cent law, but the passengers carried one mile were 9,500,000 in excess of the last year of the three-cent law, so that the increased business was actually transacted at an increase of only $32,000 in the revenue. In 1914 the passenger receipts amounted to $300,000 more than in the last year of the three-cent law, but there was an increase of 22,000,000 passengers carried one mile. In the seven years during which the two-cent law has been in effect the passenger miles increased 22,000,000. In the seven years immediately preceding the two-cent law; or, in other words, the last seven years of the three-cent law, the passenger miles increased 21,300,000, so that the increase in the last seven years of the three-cent fare was considerably more than the increase in the seven years of the two-cent law. These figures show to a certainty, from the business actually handled, that the increase under the two-cent law was less than the increase in the same period under the three-cent law. It was a perfectly natural increase, due to the increase in population and not to the decrease in the rate, just as there has been an increase in every line of business.

This particular action on the part of the state has been made the subject of pretty careful investigation by the Interstate Commerce Commission of late. The commission points to the fact that the rate of fare as fixed by this law and other state laws of a similar nature, is too low and that if the carriers are to be allowed to earn the return which they are entitled to earn under the Constitution of the United States, it can only be by increasing the rates for other transportation service. It is the law that the state traffic must bear its fair share of the earnings of the transportation company; that the state traffic cannot be handled at cost, or less than cost under state-made rates and the interstate traffic compelled at substantially increased rates not only to pay the cost of its transportation, but also to create enough net earnings to pay interest on the value of the whole investment. That is what is actually happening now, at least insofar as the passenger traffic is concerned, and it seems to me that this policy on the part of the state, entirely apart from the fact that it is inconsistent with its own best interest, is certain to result finally in the United States taking jurisdiction over the entire transportation service.

If the state takes advantage of its authority to fix rates to handicap the United States in its action relating to interstate rates, then the United States, in order to make its own action effective and just, in the very nature of things, must take jurisdiction of the entire subject and the right of the states will disappear. There can be no doubt in the world that the United State has authority to assume jurisdiction of the entire subject of railroad regulation. Each year we find certain invasions by the United States into the authority which has been exercised by the state through the acquiescence or inactivity of Congress.

In line with the suggestion of the Interstate Commerce Commission, the railway companies of Indiana, last fall, began to appeal to the people of the state for a repeal of the two-cent fare law. These meetings were held in practically every important city and town in the state and with the exception of three cities, resolutions were passed in favor of the repeal of the two-cent fare law and the enactment of a two and one-half cent fare law to take its place. When the legislature convened a bill was introduced for the purpose of putting in the form of a definite law the public sentiment which was expressed in these resolutions. These resolutions were submitted to the members of the legislature and were made the subject of a great deal of comment by the publications throughout the state, and almost without exception that comment was in favor of the enactment of that law, but when it came to a vote, it was perfectly clear that the law would not pass. When this situation was brought home to the railroads, having full confidence in the merits of their case, they asked the legislature to pass a law authorizing the Public Service Commission of the state to inquire into the question of whether the rate of two cents was fair and if a greater rate was required to fix such rate. The legislature refused to entertain this proposition. The fact is that those who were charged with the responsibility of making this public opinion in the form of a law considered more the political future than the merits of the proposition. Investments can, through the slow but certain process of litigation, secure definite relief from the existing law, but the people of the state are interested in its industrial development; they are inter-

*From an address before the student body of the University of Indiana, at Bloomington, Ind., on May 12, 1915.

ested in creating a general understanding among men of large means that capital invested in the state will be fairly dealt with. In this case the largest single investment in the state was refused an opportunity to show that it was being unfairly dealt with. When you get down to the practical question of men investing their means in the state in the future, you can appreciate that men to whom this action has been brought home will withhold investments in this state.

The thing that is most important of all, in dealing with capital, and especially foreign capital, is to invite confidence, and that certainly cannot be done by imposing upon capital which is already here a burden the unfairness of which has been conceded by local action in practically every community in the state.

It seemed inconceivable when the state is so much interested in having men feel that they can come with confidence and permanently invest their money in this state, that the state would say to the owners of these properties, which represent the largest single investment in the state, that only two cents per mile will be allowed for passenger travel and that the question of whether that is or is not sufficient will not be open for investigation. The state cannot afford in its own interest to continue any such attitude.

In 1909 the legislature passed a law requiring electric headlights on locomotives. In 1911 it passed laws increasing the liabilities for loss of freight and for injuries to persons; also, a law providing for separation of grades in smaller cities. In 1913 the law with reference to separation of grades was further amended so that now practically any city having a population of more than 19,000 can have grade separation. Numerous other laws were passed adding less important burdens to railroad operation in 1914.

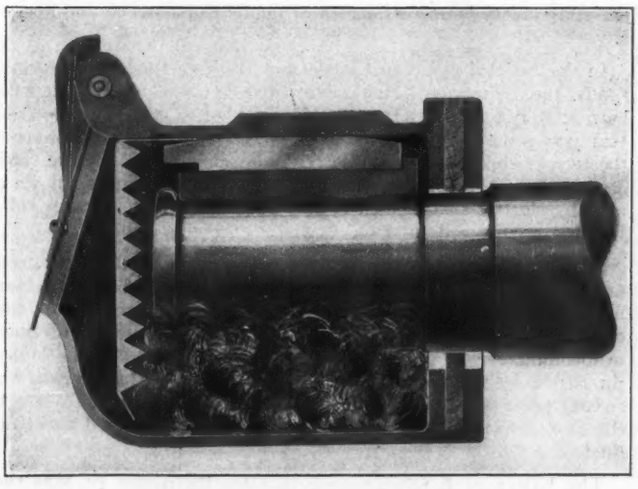
No one can successfully maintain that the Indiana railroads are earning what they should. Take the Monon—and I am giving figures which are taken from public record: In 1914 the cash investment in the Monon was $8,852,454 more than it was in the year 1900. In the year 1914, after the actual operating expenses had been paid, the amount which was left to take care of interest on bonded debt and to pay an income to the stockholders was less than the amount which remained in 1900. In other words, on this added investment of nearly $9,000,000, which had been made in the 14-year period, not one cent was earned for those who had made the investment. In the same period the state levied as its share of this return in 1900, $184,000; in 1914, $333,000. The increase in the amount of the income which the state has taken was 80.47 per cent. The increase in the property investment was 29.8 per cent.. The actual income to the owners of the property decreased 2 per cent.

It is interesting, as we observe now the avalanche of assaults which the state has been making on these investments, to hark back to the fact that in the beginning the state regarded the construction of railways so important to its internal development that it began the construction of what is now some of the important lines of railroad in the state. The first railway construction in Indiana was known as the Lawrenceburg & Indianapolis line, which was one and one-quarter miles long and opened in 1834. Its rolling stock consisted of one car which cost $222.12½, and a horse of unknown value. On the first day the total operating expenses were $12.62. The net receipts were $60. At sundown the first day a meeting of the board of directors was held and the amount remaining after paying the day's operating expenses was paid out to the owners of the property as a dividend, much to their satisfaction. That railroad was owned by citizens of the state. The first serious effort toward railroad construction in the state was the Madison & Indianapolis road. This was one of the lines the construction of which was undertaken by the state. This railroad was opened in 1838 and it had 18 miles of track completed by the month of April, 1839, and 10 miles were added later. The cost to the state of the construction of this 28 miles was $1,624,603, or $56,235 per mile. The locomotive for this particular railroad was built by the Baldwin company, in Philadelphia. It was placed on shipboard, taken down the Delaware bay into the Atlantic Ocean and was to be carried by the way of the Gulf of Mexico, Mississippi and Ohio rivers to Madison, Ind. It never arrived. The ship was sunk, and the first locomotive constructed for an Indiana line is still resting somewhere on the bottom of the sea. After the state had constructed this 28 miles at this excessive cost, it was very glad to relinquish its interest in the property to private interests, willing to complete the construction of the road.

I speak of this to show that there has been a decided reversal of state policy. This is an exceedingly important public question. If it is fairly dealt with, notwithstanding what has occurred in the past 10 years, I believe that it will be possible for our railroad credit to be restored, and fresh capital secured for our large industrial development. I do not believe that the citizens of this state can expect to have a further immigration of foreign capital unless they together join in an effort to bring about a distinct reversal of the state policy of the last 10 years, and assure fair treatment for the large investments which we find here now.

JOURNAL BOX PACKING GUARD

A packing guard for use in journal boxes which holds the packing under the journal and prevents it from working out between the lid and the box has been placed on the market by the Nuway Packing Guard Company, Tuscaloosa, Ala. It is formed from No. 14 gage steel with teeth extending back from the sides and bottom. A tongue extends back from the top of the guard, by means of which it is secured in the journal box. In applying the guard the weight of the car is raised from the journal and the box packed, the packing being pushed well back against the dustguard and the box filled only to the end of the journal. The guard is then placed in the box with the tongue, which is formed to fit the lugs at the top of the box, between the box and the wedge. When in position the weight of the car is let down on the journal, thus securely holding the guard in place. A small quantity of packing is then pushed around the sides of the guard. Holes are provided in the packing guard through which oil may be applied should the packing become dry. The guard is manufactured in different sizes and to fit the various types of journal boxes.



Packing Guard for Journal Boxes

ROLLING STOCK ON THE IRISH RAILWAYS.—The railways of Ireland on December 31, 1912, owned 901 locomotives, 3,302 passenger train cars, 22,151 freight cars and 1,030 other cars.

General News Department

The Clearing yard, near the southwest city limits of Chicago, was placed in service for the traffic of the Belt Railway only, on June 1. Interchange traffic between the 12 roads owning the Belt Railway will not be handled through this yard for the present.

A new wage schedule carrying higher pay for certain classes of trainmen on the Northern Pacific and a number of changes in working conditions has just been agreed upon by representatives of the company and of the employees, after 18 months of negotiation.

Near Lake City, Minn., on June 6, seven persons were killed, including four passengers, and several more were injured, when a passenger train on the Chicago, Milwaukee & St. Paul went through a bridge which had been weakened by a washout. Three of the cars fell into the Mississippi river.

The "Sunset-Central Boys' Educational Association" has been formed by officers of the Sunset Central Lines at Houston, Tex., for the purpose of organizing classes of office boys and messengers to study penmanship, arithmetic, typewriting and shorthand. Similar educational advantages are to be afforded to the young women employed by the company, of whom there are in Houston about 250.

The New York State Public Service Commission, Second district, announces that the statement published last week (page 1176) concerning the law to regulate the "jitney bus" had to do only with the second district. The law does not exempt the city of New York from its requirements. Under its provisions bus lines carrying passengers for fifteen cents or less in any city of the state must obtain certificates of public convenience and necessity.

In the Federal Court at Charleston, W. Va., June 4, three railroads, the Baltimore & Ohio, the Coal & Coke, and the Lewisburg & Ronceverte (electric) were fined for violation of the federal laws; the Baltimore & Ohio $1,000 for failure to observe the twenty-eight hour law relative to feeding livestock; the Coal & Coke $3,500, for violating the sixteen-hour law for employees, and the electric road, which is only four miles long, for not conforming to the federal rules regarding fittings on cars.

Among the employees of the Pennsylvania Railroad retired on pension May 1 last was William Watson, staybolt inspector in the shops at Altoona, who had been in the service of the company 34 years and for over 20 years was inspector of flues in locomotives. A portrait of Mr. Watson is given in the bulletin issued by the company, and it is calculated that during his twenty years of service in this occupation he had crawled through the fire doors of 20,000 locomotives, and had inspected 6,440,000 flues.

The Baltimore & Ohio reports that for the month of May the Shenandoah district of the road, embracing the line through the valley of Virginia from Harper's Ferry to Lexington, made a perfect record for punctuality of passenger trains; 300 passenger trains having arrived at their terminals on time. For several months the record for punctuality of trains on this road has been watched with special interest. Rivalry has been displayed by the employees to such extent that an act of negligence resulting in a delay is regarded as an offense against all of the co-workers of the district.

Railroads' Position on Mail Pay Question

The railway presidents who, to consider the question of mail pay, met in New York, following the May meeting of the American Railway Association, adopted unanimously the following resolutions:

"Resolved, that the position of the Committee on Railway Mail Pay has the approval of the representatives of the railroads present at this meeting, and that the railways of the United States continue to give their united support to the committee in its efforts to secure to the railways adequate compensation for transporting the mails.

"Resolved, further, that we believe the so-called space basis as proposed in the last Congress is wrong, and susceptible in practice of grave injustice to the railways in denying payment for services rendered.

"Resolved, further, that we endorse the views of the committee on the superiority of the existing weight basis, amended by annual weighing, payment for apartment cars and payment for or release from side or terminal messenger service.

"Resolved, further, that the Committee on Railway Mail Pay is urged to continue its work on this basis, and to ask Congress to enact a law that will give the Interstate Commerce Commission the same jurisdiction over the mail traffic that it now has over all other traffic of the railroads."

The chairman of the meeting was Howard Elliott, president of the New York, New Haven & Hartford. All of the proposals of the roads' committee were fully discussed, and, as stated in the resolutions, were fully endorsed; and the meeting represented fully 90 per cent of the railway mileage of the country. Of the half dozen prominent companies which do not appear in the list of roads represented, all are known to hold the same views as those embodied in the resolutions.

THE GREATEST ASSET OF THE PENNSYLVANIA RAILROAD*

THE management of the Pennsylvania Railroad System believes that the Company's greatest asset is the loyalty and efficiency of its men.

* * *

In normal times the Pennsylvania System has 250,000 employees. The Company pays the highest prevailing rate of wages received by railroad employees in the territory in which it operates. The policy of the Pennsylvania System is to insure that all its relations with its men shall be characterized by fairness and friendliness.

* * *

The Pennsylvania System early realized the importance of training its own officers. This, of course, carries with it the training of its own men. To make the service attractive it is essential that employment, as far as possible, be permanent.

* * *

The man of today is the officer of tomorrow. The organization is in substantial respects a civil service.

* * *

This Company is endeavoring continually to develop its organization, to assure itself of the loyalty of its men, and to build up an efficient and economical transportation enterprise.

*A placard, 12 in. x 20 in., posted in Pennsylvania Railroad stations.

Michigan Legislation

Senate bill No. 234, providing for the inspection of boilers, was not passed by the lower house of the Michigan legislature, and our account of the bills which became law in that state this year, published May 28, page 1124, is erroneous in that particular.

Washington Railroads, 5166 Miles

The Public Service Commission of the state of Washington reports that 400 miles of new main line have been added by Washington railroads during the past year, showing an aggregate of 5,165 miles as of January 1, 1915, excluding logging roads and electric lines.

Including second track and sidings, the railroads now show 7,235 miles of track. The principal increases during the past

year include 135 miles on the Wenatchee branch and a five mile Interbay line built by the Great Northern; 103 miles by the Spokane "air line," 43½ miles by the Northern Pacific (the new Point Defiance line) and 13½ miles added to the North Yakima & Valley; 39 miles on the Chicago, Milwaukee & St. Paul; Willapa Harbor line and 29½ miles of the Seattle, Port Angeles & Western.

Following is the detailed statement mileage shown by the railroads in their 1914 and 1915 reports:

Railroad	1914	1915
Bellingham & Northern	49.5	49.6
Chicago, Milwaukee & St. Paul	*637.4	580.4
Colorado & Puget Sound	55.2	55.7
Great Northern	855.5	1,005.0
Northern Pacific	1,767.9	†1,863.2
North Yakima & Valley	†39.0	.....
Oregon Trunk	.7	.7
O. W. R. & N.	787.0	898.0
P. S. & Willapa Harbor	9.5	48.6
Spokane & B. C.	36.3	36.3
Spokane International	17.7	17.7
S. P. & S.	409.6	409.6
Tacoma Eastern	92.1	92.1
Washington, Idaho & Montana	3.3	3.3
Waterville Railway	5.1	5.1
Idaho & W. N.	.....	*70.8
Seattle, P. A. & W.	.....	29.5
Total miles	4,765.8	5.165.6

*The Idaho & Washington Northern is included with the C. M. & St. P. for 1914, and the (†) North Yakima & Valley is included with the Northern Pacific for 1915.

Report on Oakwood (Wis.) Derailment

The Interstate Commerce Commission has issued a report, dated April 28, on the derailment of a passenger train on the Chicago, Milwaukee & St. Paul at Oakwood, Wis., January 30, when 21 passengers were injured. The train was derailed at a crossover when running about 55 miles an hour, and Inspector H. W. Belnap concludes that the cause of the derailment was the breaking of a steel tired wheel of the baggage car, the middle wheel on the right-hand side of a six-wheel truck, the forward truck of this car. The wheel was of a built-up type, cast iron hub or spider, two rolled steel cheek plates and a rolled steel tire. The parts were held together by 39 bolts. The tire broke into four pieces and it was found that ruptures through the bolt holes had started, in each case, at the inner diameter of the tire, thence passing through the metal in an outward direction to the surface of the tire and through the flange. Considerable wear was found at the bearing between the plate and the tire. The mate of the broken wheel was taken apart and in it were found incipient cracks at each of the twelve bolt holes in the tire; and similar incipient cracks were found in other wheels examined. None of these cracks were visible until the outer circle of bolts was taken out or one of the plates removed. The broken wheel had not been overloaded. It had run 276,396 miles, having been changed from one car to another a half dozen times. The study of the broken wheel, and of others of the same type, was made by J. E. Howard, engineer. He concludes that tires of this type are sometimes loose, while yet the looseness is not detected by the ordinary inspections. His principal recommendation is for better inspection of the metal at the bolt holes, which means, of course, that wheels would have to be taken apart, as the cracks above referred to cannot be seen in an ordinary inspection.

Legislation Affecting the New Haven Road

[From a statement by Howard Elliott, president of the New York, New Haven & Hartford, issued on the final adjournment of the Massachusetts legislature.]

During the past year a large amount of work has been done by the officers of the company, the public service commissions, the legislatures and the state executives in studying the complicated corporate and financial relations of the New Haven system and the differences in the laws of Connecticut, Massachusetts and Rhode Island. As the result of this study and of numerous conferences between the public service commissioners and the officers of the company, various bills were drafted, which have been passed as follows:

In Rhode Island (March 28): A general law curing certain minor defects in the corporate stock status of the company and making legal under suitable restrictions the issue of preferred stock and of mortgage bonds.

In Connecticut (March 19): A law permitting the company to make use of certain of its treasury securities as collateral for short-time loans.

A general law (May 19) reducing the powers of the New Haven company and providing for increased supervision by the public utilities commission of Connecticut; providing that at least two-thirds of the directors of the company shall live in Connecticut, Massachusetts and Rhode Island, and permitting, under suitable restrictions, the issue of preferred stock and of mortgage bonds.

In Massachusetts (May 31): A law prohibiting the issue of fractional shares of stock, making the practice in Massachusetts similar to that of Connecticut and Rhode Island.

A law (May 31) permitting the issue of preferred stock.

A law (June 4) removing the obstacles and defining the limits to the issues of mortgage bonds and evidences of indebtedness and permitting this kind of financing in accordance with modern business requirements.

A law (June 4) validating the New Haven securities as of May 15, 1915, and providing for an investigation by the public service commission of the capital expenditures, investments and contingent liabilities of the New Haven company and their validity under the laws of Massachusetts and under the laws of any other state in which the company is organized; their report to be made not later than February 1, 1916, at an expense not exceeding $10,000, to be paid by the New Haven company. Also, for an investigation by the public service commission, the port directors and the attorney-general, of the rates to and from the Commonwealth pier in Boston, under the contract of July 1, 1912, between the state and the New Haven and Boston & Maine companies.

The passage of these bills gives the company the legal right to submit to its stockholders some plan for financing its present floating debt and for obtaining money for future needs if business conditions justify.

Now that these bills have been passed there is much work to be done in preparing any plan and in obtaining the necessary approval of the public service commissions of the states.

In trying to harmonize the laws of these states, there have been some differences of opinion among interested parties. . . . The public service commissioners, the members of the legislature, the executives and the company have all yielded something, with the result that the bills, while not giving all that the various parties wanted, are a long step forward in putting the New Haven in a position to re-establish its credit and to perform its duty as a common carrier.

The validation bill calls for an investigation, and the company is anxious to have that work proceed rapidly. It hopes that the public service commission can complete their report in the late autumn and it will co-operate in every way. As a result of the recent investigation of the company's affairs by the Interstate Commerce Commission, the Congress of the United States and the department of justice, there is a very large amount of material ready, which is at the disposal of the commission.

The company is ready to submit all information and facts about the Commonwealth pier contract of July 1, 1912. The rates on business controlled by the New Haven company conform to the terms of that contract. . . . The New Haven is owned very largely in New England, and with a resumption of business a restoration of confidence and credit should receive financial nourishment and support from its owners and from the public who live along its lines. The business men of New England have given greater attention than ever before to the question of railroad transportation, and have loyally supported the management in its efforts to obtain the remedial legislation.

The great interest and cordial support of the press of New England were also most helpful elements in working out the problem. In fact, if the plans of the company had not been presented in considerable detail to the public and to the business men of New England, and if those plans had not appealed to their judgment, the bills probably never would have become laws. The legislative sessions have ended with improved and more cordial relations between the company, the public, many business organizations, and the representatives of the state governments, which is a source of gratification to the company and a valuable asset for the future.

For the company I desire to express its thanks for the co-operation of all. A most important result is that the passing of these laws marks the starting out of a course of constructive

work in helping to build up the New Haven and the New England transportation business, the success of which is so essential to New England.

Some New Jersey Railroad History

As is well known to most persons traveling by rail between New York and the west, the lines reaching the west shore of the Hudson river, opposite the city, encounter a serious obstacle in the high ridge that extends north and south for a long distance a mile or two back of the river, a mountain of rock, Bergen Hill. The tracks of the Pennsylvania Railroad—the line which was built and for years operated by the New Jersey Railroad & Transportation Company—run through a deep cut at Marion, about two miles west from the river front, known today as Shanley's cut; the Erie and the Delaware, Lackawanna & Western get through the mountain by means of tunnels, and the Central of New Jersey passes around the south end of the ridge, through Bayonne. To most of the present generation all of these routes are old institutions; but from an article in the Erie Railroad Employees' Magazine, by John S. Bell, vice-president of the Morristown & Erie Railroad, it appears that at one time or another all of the roads named, as well as the Lehigh Valley, reached the Hudson river over the Shanley's cut route. Mr. Bell says:

"I find that many railroad men never heard of the old Bergen cut, so long used by the Erie Railroad. It was through this cut, after the passenger terminal at Piermont was abandoned, that the trains of the Erie Railroad reached New York, or rather the west side of the Hudson river opposite New York. All Erie passenger trains reached the Hudson river through this cut until April, 1861. This cut was made, in the construction of the New Jersey Railroad & Transportation Company's line, in the early thirties. That road extended to New Brunswick, 31 miles; where passengers transferred to the Camden & Amboy, which took them to Trenton, whence they went to Philadelphia over the Philadelphia & Trenton. In the early days there was a transfer by horse power both in Philadelphia and in Baltimore on the route to Washington.

"Before the consolidations which we know in the present day the companies running trains through the Bergen cut were the New York & Erie (now the Erie), the Northern Railroad of New Jersey, the Morris & Essex, the Central of New Jersey, the Hackensack & New York and the New York, Susquehanna & Western. [All lines from the west, except the Central of New Jersey, have connections one with another west of the Bergen Hill.] The only one of the roads named which did not at one time or another run trains through the cut with their own locomotives was the Central of New Jersey, which delivered its cars to the New Jersey Railroad & Transportation Company at Elizabeth. The trains of the Morris & Essex, in the early fifties, were coupled to the New Jersey Railroad trains at the foot of Centre street, Newark. The Morris & Essex afterward left this line, and in 1863 made a contract with the Erie; this line was used until 1876, when the Morris & Essex began using its own tunnel to the Hoboken terminus.

"The Erie Railroad ran through the cut from 1853 until 1861, when its own tunnel was completed. The Northern of New Jersey began running through the Erie tunnel in 1869. The New York, Susquehanna & Western continued using the Pennsylvania terminus for a number of years after coming under the control of the Erie, but about three years ago began using the Erie terminus. The Lehigh Valley, which now uses the terminus of the Central of New Jersey, connecting with the line of that road a few miles out, used the Pennsylvania terminus (and the Pennsylvania tracks from Newark) from the time of the completion of its New York line, until about one year ago."

The West Shore, which is comparatively young—only about 30 years old—has its terminus at Weehawken two or three miles up the river, but it ran a few trains to the Pennsylvania terminal, through the Bergen cut, until about four years ago. The Pennsylvania itself, which now runs substantially all its through passenger trains to and from Thirty-second street, New York City, passing under both the Bergen ridge and the Hudson river by its tunnel, has left its Jersey City passenger terminal comparatively deserted, and the Bergen cut enters on another chapter of its history. But, though the Jersey City passenger terminal has lost its importance the cut continues to be the channel for two main currents of traffic, namely, freight, including much express freight, to the Hudson river terminals of the Pennsylvania Railroad, and the electric passenger trains between Park place, Newark, and Church street, New York city, which run through the Hudson & Manhattan tunnel.

Mr. Bell estimates that when all the roads entering Jersey City ran their trains through the cut the total number of passenger trains daily, out and in, did not exceed 100. At the present time he estimates that all of the roads, including the West Shore and those that reach New York through the tunnels under the river, have a total of over 1,300 trains a day.

The Erie and some of the other roads in the early days had tracks of 6 feet gage and the tracks through the cut had three rails. The broad gage engines had smokestacks painted black, while the standard gage engines had stacks painted red. All were wood burners. On the New Jersey Railroad all trains used the left hand track; and a single short blast of the whistle meant, not to put on the brakes, but to let them off; and in those days the whistle signal meant something, for the air brake had not been invented. Before the Civil War the time required for a passenger journey from Jersey City to Washington was twelve hours, and the single fare was $10. At present the price of a roundtrip ticket is $10, and the journey, one way, is made in five hours.

Railway Telegraph Superintendents

The thirty-fourth annual meeting of the Association of Railway Telegraph Superintendents will be held at the Powers Hotel, Rochester, N. Y., June 22, 23, 24 and 25. There will be an informal assembly in the hotel on Monday evening, the 21st. Among the subjects scheduled for discussion at the business meetings are: Primary versus dry battery for transmission on telephone lines; Screened cable conductors; Censorship of railway messages; Interference from high tension power lines.

United Yardmasters' Association

The program for the convention of the United Yardmasters' Association, to be held in Seattle from June 15 to 19, inclusive, provides for business sessions on June 15, 16, 17 and 19, with various entertainment features. The program includes papers by J. J. McCullough, superintendent of the Puget Sound division of the Northern Pacific on "Rough Handling of Freight"; G. H. Hunt, freight claim agent of the Chicago Great Western on the same subject; R. M. Calkins, general traffic manager of the Chicago, Milwaukee & St. Paul on "Duties of the Yardmaster Toward the Public"; J. M. Daly, former general superintendent of transportation of the Illinois Central, on the subject of "Per Diem"; A. J. Hillman, general agent of the Chicago, Milwaukee & St. Paul, on "Yard and Terminal Work"; C. S. Price, general yardmaster of the Great Northern at Seattle, on "Rough Handling of Cars." Each paper is to be followed by general discussion.

Railway Real Estate Association

This is the name of an association which has been formed by officers of a number of prominent roads and the purpose of which is perhaps sufficiently explained by the title, indicating the department to which these gentlemen belong.

From a statement issued by Frank C. Irvine, secretary, Pittsburgh, Pa., it appears that the association has been organized to comprise within its membership all officers, and their staffs, of the railways of America, Canada, Mexico and Cuba directly concerned in the various activities pertaining to the land of their respective corporations. Provision is made for the formation of sections, as "Tax Division," "Agricultural Division" and "Right of Way Division." The first meeting of the association is scheduled to be held in Chicago, October 13 next.

A constitution has been adopted; and, acting on the provisional organization, the following officers have been chosen: President, F. P. Crandon (C. & N. W.); first vice-president, J. D. McCubbin (B. & O.); second vice-president, B. A. McAllaster (Sou. Pac.); secretary, Frank C. Irvine (Pennsylvania Lines); treasurer, James G. Armstrong (W.-P. T.).

The following roads are represented in the roll of charter members of the association: Algoma Central & Hudson Bay; Baltimore & Ohio; Bessemer & Lake Erie; Buffalo Rochester & Pittsburgh; Canadian Pacific; Chesapeake & Ohio; Chicago, Burlington & Quincy; Chicago Great Western; Chicago, Rock Island & Pacific; Chicago & North Western; Cincinnati, Ham-

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL, 1915

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Alabama & Vicksburg	143	$78,164	$26,030	$114,853	$17,513	$29,202	$4,146	$43,472	$1,938	$5,506	$101,776	$13,077	$8,750	$4,327	—$9,727
Atchison, Topeka & Santa Fe	8,514	5,447,109	2,011,851	8,130,063	1,117,474	1,361,085	203,058	2,272,119	.....	156,093	5,101,535	3,028,529	397,180	2,630,270	—161,373
Baltimore & Ohio Chicago Terminal	79	.....	488	114,167	9,532	15,261	749	47,498	1,302	4,323	77,372	36,795	17,653	18,841	22,017
Belt Ry. Co. of Chicago	24	.....	.....	233,269	15,904	23,313	700	79,384	.....	5,833	125,134	108,135	13,304	94,830	3,565
Bingham & Garfield	27	128,202	3,063	131,666	13,709	16,290	1,018	17,835	57	1,619	50,527	81,139	6,688	74,451	—17,436
Birmingham Southern	43	33,727	592	50,597	7,228	10,852	883	20,910	.....	3,197	43,069	7,528	2,063	5,464	—15,429
Boston & Maine	2,302	2,294,800	1,159,559	3,815,972	632,613	501,662	37,326	1,630,077	14,923	85,553	2,902,153	913,818	163,016	750,802	110,637
Buffalo & Susquehanna R. R. Corporation	253	104,409	6,009	113,665	18,973	41,188	967	34,323	.....	5,558	101,009	12,657	2,600	10,057	46,359
Buffalo & Susquehanna Railway	91	12,529	5,378	20,078	4,297	6,099	413	11,033	7	2,294	24,143	—4,065	1,600	—5,665	2,643
Buffalo, Rochester & Pittsburgh	586	589,770	82,307	698,729	94,840	152,529	11,037	247,956	923	21,194	528,479	170,250	20,000	149,970	210,683
Chesapeake & Ohio Lines	2,372	2,885,196	431,651	3,525,308	423,792	712,586	51,039	1,078,693	17,727	72,086	2,353,685	1,171,623	115,009	1,056,537	251,477
Chicago & Alton	1,033	685,314	281,295	1,063,634	156,745	339,466	36,093	409,557	9,137	31,771	982,768	80,866	43,021	37,745	—3,548
Chicago & North Western	8,108	3,757,825	1,480,651	5,884,995	643,360	1,000,722	100,517	2,266,459	49,910	148,090	4,206,767	1,678,228	375,000	1,302,685	169,116
Chicago Great Western	1,427	698,197	225,637	1,021,046	180,570	217,955	46,346	399,045	7,883	26,832	878,242	142,804	47,150	95,571	—66,631
Chicago, Indianapolis & Louisville	618	373,128	141,214	559,689	67,601	68,553	22,151	195,380	Cr. —1	16,355	370,026	189,663	27,279	162,314	92,683
Chicago, Milwaukee & St. Paul	10,071	4,892,937	1,261,011	6,877,038	775,748	1,174,022	130,644	2,792,665	51,474	153,262	4,935,563	1,941,475	385,438	1,554,303	—230,375
Chicago, Peoria & St. Louis	255	94,925	18,281	121,407	22,596	26,775	5,845	52,905	.....	5,374	113,496	7,912	5,700	2,212	16,781
Chicago, Rock Island & Gulf	477	137,087	42,703	199,111	27,774	36,274	9,537	86,887	1,925	7,928	170,326	28,785	8,094	20,656	—14,932
Chicago, St. Paul, Minneapolis & Omaha	1,753	816,662	356,207	1,286,660	85,971	203,194	28,503	496,174	14,084	36,839	864,290	422,370	76,102	346,045	65,697
Cincinnati, Hamilton & Dayton	1,003	559,055	104,735	739,773	146,764	183,546	18,209	325,074	3,039	40,599	717,039	22,734	34,616	—11,890	—5,341
Cincinnati, New Orleans & Texas Pacific	337	641,068	112,818	804,842	72,057	166,423	21,423	249,603	7,300	18,701	534,363	270,479	31,000	239,435	29,136
Cleveland, Cincinnati, Chic. & St. Louis	2,381	1,931,302	596,829	2,786,677	379,378	400,093	68,299	1,139,311	23,106	70,728	2,076,963	709,714	128,000	580,784	605,473
Colorado & Southern	1,089	423,521	102,749	575,819	78,226	148,998	8,935	185,927	3,575	21,316	446,976	128,843	35,000	93,834	—7,623
Cumberland Valley	164	186,654	49,194	246,375	47,896	29,464	4,308	74,688	867	8,690	165,912	80,463	5,794	74,668	—41,568
Delaware & Hudson Co.—R. R. Dept.	881	1,730,982	190,939	2,056,513	134,780	270,367	25,179	647,646	10,588	67,099	1,155,668	900,845	58,500	842,345	—148,965
Delaware, Lackawanna & Western	959	2,778,394	616,719	3,757,256	392,129	599,129	75,145	1,128,831	27,731	72,683	2,259,982	1,497,273	186,600	1,310,516	279,470
Detroit & Mackinac	400	63,602	22,552	91,254	11,979	17,654	1,909	31,435	.....	2,900	65,877	25,377	7,616	17,761	—12,049
Duluth, Missabe & Northern	369	256,232	25,919	287,315	52,812	69,447	2,004	70,487	1,682	9,061	205,492	81,823	14,407	67,416	284,390
El Paso & Southwestern Co	1,027	504,567	112,636	661,468	94,739	88,115	19,110	169,414	6,211	23,814	401,402	260,066	34,889	225,177	—106,194
Gulf & Ship Island	308	113,426	22,002	145,516	18,118	30,629	2,997	34,640	308	6,502	93,194	52,321	7,566	44,727	18,368
Illinois Central	4,767	3,323,410	946,576	4,655,279	777,871	1,111,231	101,995	1,735,465	28,443	125,953	3,862,177	793,103	254,400	535,452	75,391
Indiana Harbor Belt	110	.....	.....	274,869	36,784	27,126	2,778	107,330	.....	7,375	181,394	93,475	8,080	85,364	34,265
International & Great Northern	1,159	450,653	108,593	610,757	118,586	95,858	20,622	307,659	2,575	29,889	575,189	35,568	40,000	—5,042	—33,648
Kanawha & Michigan	177	190,601	25,791	223,256	28,199	45,953	3,098	64,013	3	5,686	146,952	76,303	11,360	64,942	—1,927
Lehigh & New England	296	248,377	1,085	260,425	37,864	34,174	2,722	59,530	.....	5,647	139,937	120,487	5,104	115,383	9,726
Lehigh Valley	1,443	3,278,619	280,235	3,782,270	307,755	641,676	88,405	1,268,737	9,987	73,248	2,388,818	1,393,452	142,500	1,250,470	310,131
Long Island	398	360,289	533,255	1,013,241	136,796	123,974	10,005	432,716	6,658	30,800	740,949	272,292	78,014	193,761	9,791
Maine Central	1,219	566,711	232,352	858,788	116,719	134,313	10,701	314,476	2,381	28,774	607,363	251,425	53,087	198,315	5,795
Missouri, Oklahoma & Gulf	334	62,787	14,789	80,895	16,677	40,745	4,421	39,902	110	13,257	115,112	—34,217	5,128	—39,361	—19,486
Mobile & Ohio	1,122	776,657	86,318	914,628	83,107	165,732	32,885	332,111	2,410	29,372	645,618	269,010	33,953	234,913	54,889
Nashville, Chattanooga & St. Louis	1,231	658,270	186,643	928,931	175,410	179,427	46,706	349,977	7,315	31,168	789,941	138,990	26,000	112,715	—82,744
New Orleans & North Eastern	204	224,800	40,242	291,398	29,967	67,527	10,961	96,978	5,581	11,423	222,437	68,961	15,000	53,961	2,685
New Orleans Great Northern	283	104,676	18,726	134,745	18,594	22,105	1,502	39,706	137	5,829	87,873	46,872	3,020	43,851	—15,323
New Orleans, Mobile & Chicago	403	125,050	19,393	152,775	23,293	21,052	4,481	52,437	Cr. —4	7,219	108,478	44,297	6,401	37,801	—1,237
New Orleans, Texas & Mexico	286	77,263	23,824	108,743	19,629	23,937	2,363	50,999	.....	10,571	107,499	1,244	1,502	—317	18,984
New York, Chicago & St. Louis	568	819,022	95,065	950,894	95,248	192,924	51,014	441,532	5,072	21,415	807,205	143,689	40,000	103,688	57,765
New York, Ontario & Western	568	554,657	83,868	749,971	94,391	126,975	8,360	287,633	.....	15,942	533,302	216,670	20,000	196,653	49,343
Norfolk Southern	900	256,411	68,400	344,087	45,195	50,167	7,039	141,757	78	18,633	262,869	81,218	9,976	71,238	81,311
Northern Pacific	6,498	3,297,136	955,811	4,682,890	744,862	499,152	106,488	1,406,522	69,470	102,312	2,874,857	1,808,033	377,700	1,429,230	59,908
Pennsylvania *Company*	1,757	3,101,533	741,443	4,226,248	631,235	835,474	76,163	1,552,907	32,074	111,607	3,239,461	986,787	257,143	729,413	210,764
Pennsylvania *Railroad*	4,512	10,828,130	2,998,655	15,267,950	1,956,845	3,103,935	185,981	5,367,579	210,156	448,073	11,272,570	3,995,379	637,618	3,353,529	120,569
Philadelphia, Baltimore & Washington	717	848,021	708,545	1,743,884	252,116	330,080	25,399	696,286	25	51,008	1,354,914	388,971	53,883	335,072	—2,848
Pittsburgh, Cincinnati, Chic. & St. Louis	1,479	2,228,209	592,013	3,162,308	462,826	649,645	63,350	1,149,024	24,671	86,525	2,436,041	726,267	154,571	571,103	220,842
St. Joseph & Grand Island	258	89,137	22,101	119,806	-24,969	24,722	4,363	43,339	.....	4,831	102,224	17,582	7,620	9,852	25,973
St. Louis & San Francisco	4,749	2,343,813	685,489	3,241,533	503,298	491,248	68,293	1,080,990	.....	90,844	2,217,966	1,023,567	100,860	921,115	577,209
St. Louis, Brownsville & Mexico	548	141,056	51,925	208,134	32,028	18,458	5,735	67,918	.....	10,795	134,778	73,356	6,500	66,788	—10,524
San Pedro, Los Angeles & Salt Lake	1,132	580,206	217,662	863,979	56,428	125,876	33,848	252,533	17,103	18,234	504,021	359,957	46,031	313,863	58,995
Seaboard	3,119	1,344,485	410,830	1,971,192	188,546	279,844	59,208	674,556	10,146	51,990	1,264,289	706,903	86,046	620,403	—50,755
Southern	7,022	3,620,908	1,134,393	5,212,784	702,956	807,056	164,940	1,840,512	30,731	160,180	3,693,563	1,519,222	217,205	1,300,143	104,124
Southern Pacific	6,517	4,493,133	2,417,519	7,744,558	984,406	1,257,231	188,188	2,513,691	156,642	213,165	5,277,196	2,467,363	340,925	2,125,302	—379,226
Union R. R. of Baltimore	9	111,256	23,312	135,933	15,154	.....	.....	4,583	.....	2,558	22,295	113,637	5,825	107,812	4,301
Union R. R. of Pennsylvania	31	.....	.....	243,909	46,217	85,315	197	122,642	.....	4,275	258,645	—14,736	5,301	—20,037	32,864
Vicksburg, Shreveport & Pacific	171	69,222	29,850	112,072	19,106	27,935	3,578	41,294	1,826	5,093	98,832	13,240	8,100	5,140	—24,737
West Jersey & Seashore	356	176,247	267,244	487,300	98,450	82,383	11,219	215,332	2,028	14,814	424,226	63,074	28,640	34,403	—61,568
Western Maryland	661	688,965	68,246	793,259	102,593	137,208	19,805	250,535	5,202	18,178	534,347	258,912	26,500	232,412	206,686
Wheeling & Lake Erie	459	340,119	36,223	414,802	51,441	84,134	10,914	175,463	1,117	13,041	336,110	78,693	31,207	47,485	7,551
Yazoo & Mississippi Valley	1,382	742,316	154,332	951,116	159,032	134,542	17,393	338,542	1,417	25,498	673,917	277,199	51,000	226,118	127,170

ilton & Dayton; Cleveland, Cincinnati, Chicago & St. Louis; Delaware & Hudson; Duluth & Iron Range; Erie; Georgia Southern & Florida; Grand Rapids & Indiana; Hocking Valley; Lake Erie & Western; Long Island; Louisville & Nashville; Michigan Central; Mobile & Ohio; Nashville, Chattanooga & St. Louis; New York Central; New York Westchester & Boston; Oregon Short Line; Pennsylvania Lines West of Pittsburgh; Pere Marquette; Pittsburg, Shawmut & Northern; Pittsburgh & Lake Erie; San Pedro, Los Angeles & Salt Lake; Southern; Southern Pacific; Toledo; St. Louis & Western; Toledo & Ohio Central; Wabash-Pittsburgh Terminal; West Side Belt; Wheeling & Lake Erie; Vandalia.

The enrollment fee is $5 and annual membership dues $3.

MEETINGS AND CONVENTIONS

The following list gives the names of secretaries, dates of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

American Association of Demurrage Officers.—F. A. Pontious, 455 Grand Central Station, Chicago. Next meeting, July 21, 1915, Milwaukee, Wis.

American Association of Railroad Superintendents.—E. H. Harman, Room 101, Union Station, St. Louis, Mo. Next meeting, August 19-20, 1915, San Francisco, Cal.

American Railroad Master Tinners, Coppersmiths and Pipefitters' Association.—W. E. Jones, C. & N. W., 3814 Fulton St., Chicago. Annual meeting, July 13-16, 1915, Hotel Sherman, Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Annual meeting, June 9-11, 1915, Atlantic City, N. J.

American Railway Tool Foremen's Association.—Owen D. Kinsey, Illinois Central, Chicago. Annual meeting, July 19-21, 1915, Hotel Sherman, Chicago.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Annual meeting, June 22-26, 1915, Hotel Traymore, Atlantic City, N. J.

American Society of Civil Engineers.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York. Next spring meeting, June 22-25, 1915, Buffalo, N. Y. Annual meeting, December 7-10, 1915, New York.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Semi-annual meeting with Master Car Builders' and Master Mechanics' Associations. Annual meeting, October, 1915.

Association of Railway Telegraph Superintendents.—P. W. Drew, Soo Line, 112 West Adams St., Chicago. Annual meeting, June 22-25, 1915, Rochester, N. Y.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York. Next meeting, June 22-23, Niagara Falls, N. Y.

Engineers' Society of Western Pennsylvania.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday of each month, Pittsburgh.

Freight Claim Association.—Warren P. Taylor, Traffic Manager, R. F. & P., Richmond, Va. Annual meeting, June 16, 1915, Chicago.

General Superintendents' Association of Chicago.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

International Railway General Foremen's Association.—Wm. Hall, 1126 W. Broadway, Winona, Minn. Next convention, July 13-16, 1915, Sherman House, Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, C. H. & D., Lima, Ohio. Annual meeting, August 17, 1915, Philadelphia, Pa.

Master Car Builders' Association.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Annual meeting, June 14-16, 1915, Atlantic City, N. J.

Niagara Frontier Car Men's Association.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

Peoria Association of Railroad Officers.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

Railroad Club of Kansas City.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

Railway Supply Manufacturers' Association.—J. D. Conway, 2136 Oliver Bldg., Pittsburgh, Pa. Meetings with Master Car Builders and Master Mechanics' Associations.

Railway Telegraph and Telephone Appliance Association.—G. A. Nelson, 50 Church St., New York. Meetings with Association of Railway Telegraph Superintendents.

Salt Lake Transportation Club.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. R. R., Atlanta, Ga. Next meeting, July 15, 1915, Atlanta. Annual meeting, January, 1916.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

Toledo Transportation Club.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

Traffic Club of Chicago.—W. H. Wharton, La Salle Hotel, Chicago.

Traffic Club of Pittsburgh.—D. L. Wells, Genl. Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings bi-monthly, Pittsburgh. Annual meeting, 2d Monday in June.

Train Dispatchers' Association of America.—J. F. Mackie, 7122 Stewart Ave., Chicago. Annual meeting, June 15, 1915, Minneapolis, Minn.

Transportation Club of Detroit.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

Utah Society of Engineers.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

Traffic News

The Southern Pacific announces that it has booked an average of one special train for every other day between now and the first of October to the Panama-Pacific Exposition at San Francisco.

The steamboat Steel City, which has just been put in service on the Illinois river and Mississippi river by the Chicago, St. Louis & Gulf Transportation Company, reached New Orleans on June 6, on its first trip, which is to be the beginning of a regular service.

The New York State Public Service Commission, Second district, has authorized the Long Island Railroad to equalize commutation ticket rates on the basis of four mills a mile; which will cause a small increase in monthly tickets between New York and points east of Bayport and Holtsville.

The lower house of the Illinois legislature has passed, on second reading, an amendment to the senate bill permitting the exchange of newspaper advertising for railroad transportation and to permit the issuance of passes to members of the general assembly. The bill was advanced to a third reading.

The midnight passenger trains between St. Louis and Kansas City, which were discontinued by several roads in January, 1914, were restored on June 1, by the Missouri Pacific and the Wabash, and on June 6, by the Chicago & Alton and the Chicago, Burlington & Quincy. Trains leave each city shortly before midnight and arrive at the other city early the next morning.

The Chicago, Milwaukee & St. Paul has announced that on June 20 it will put in service a new train to the Pacific coast via the Union Pacific and Southern Pacific to San Francisco. The train will be known as the "San Francisco Limited," and will leave Chicago at 9:35 p. m. On the same day a new train, the "Denver Special" will be put on between Chicago and Colorado.

A new passenger train between Chicago and California will be put in service on Saturday, June 19, by the Chicago & North Western, Union Pacific and Southern Pacific. The train will leave Chicago daily at 10:30 a. m., arriving at San Francisco at 9:30 a. m. the third day; and the eastbound train will leave San Francisco at 10:20 a. m., arriving at Chicago at 11:00 a. m. the third day.

A. O. Eberhart, former governor of Minnesota, has been elected president of the newly-organized River Terminal Association, with headquarters at St. Louis, Mo. As chairman of the executive committee of the association he has stated in a report that the construction of river terminals will be undertaken in at least 15 towns of the Mississippi valley during the present year.

The Pennsylvania and the Philadelphia & Reading both have reduced, from $75 to $62.50, the price of 150-trip tickets between Philadelphia and Atlantic City, Cape May and other points on the south Jersey coast. It appears that from Camden, N. J., across the river from Philadelphia, the rate for these tickets is $60, which rate could not be advanced because of the disapproval of the New Jersey Public Utilities Commission; and now because of the facility with which Philadelphia passengers can cross the river and avail themselves of the intrastate rate, the railroads have concluded to reduce the interstate rate. The distance from Camden to Atlantic City is 59 miles.

Freight Traffic Manager C. E. Perkins, of the Missouri Pacific, has notified station agents to refuse to allow consignees of bulk freight to peddle goods out of cars at destination. The use of cars as salesrooms, for the disposal of apples and other freight, has become too common to be tolerated; and the practice is now forbidden not only on account of considerations of economy, but also because of the possibility of bodily accident to persons doing business in, on or around freight cars. If a consignee does not unload his freight promptly within the free time agents are instructed to have the goods unloaded into public warehouses.

The lines operating from Key West to Chicago have made some good records recently on special trainload movements of Cuban pineapples. The cars are loaded in Havana and thence carried to Key West on the car ferry of the Florida East Coast. From Key West to Chicago the special trains are run over the Florida East Coast, the Atlantic Coast Line, the Central of Georgia, the Nashville, Chattanooga & St. Louis and the Illinois Central. The distance is 1,767 miles and four trains have been run through in an average time from Key West to Chicago of 86 hours. The fastest run was 81 hours, which, for the distance, made an average running time of 21.8 miles an hour, including stops.

Panama Canal Traffic in April

The Canal Record reports the total quantity of freight going through the Panama Canal in April as 522,841 tons; eastbound, 285,457 tons, and westbound, 237,384 tons. The total in March, the heaviest month on record, was 635,057 tons. Other interesting facts in the statement are the following:

Tolls in April	$442,415
Tolls since opening, net	$3,274,566
Commodities in April—	
Cacao from South America, tons	6,446
Canned fish from Washington, Oregon and California, tons	5,544
Coal, tons	14,126
Copper from South America, tons	5,766
Flour from New York, tons	1,000
Flour from Puget Sound, tons	14,407
Gasoline, tons	6,462
Total westbound United States coasting trade, tons	68,271
Total New York to South and Central America, tons	22,515
Total New York to China, etc., tons	23,873
Total Europe to California, etc., tons	3,893
Total United States coastwise, eastward, tons	27,438
Total South America to Europe, tons	6,482
Total South America to New York, tons	3,544
Nitrates from South America, tons	68,027
Refined petroleum, Atlantic ports to Hawaii, China, etc., tons	22,297
Sugar, Hawaii to New York, tons	31,687

The average loading of all the vessels passing through the canal since its opening has been 5,156 tons.

NEW RAILWAY LINK BETWEEN SERVIA AND ROUMANIA.—It is reported from Rome that for several weeks past thousands of workmen have been engaged on the construction of a railway line between Negotin in Servia and Severinu in Roumania. This line, which is nearing completion, will link up the Roumanian railway system with Salonika. Russia and Roumania will then be able to receive supplies direct from Salonika, and send their cereals to other parts of Europe.

DISCOVERY OF OXYGEN.—The discovery of oxygen is generally credited to Dr. Joseph Priestly, an English clergyman and scientist. The date, August 1, 1774, is commemorated as the birthday of modern chemistry. At about the same time two others made the same discovery: Scheel, a Swedish apothecary, who called it "fire air"; and Lavoisier, a French chemist, who called it oxygen, meaning "acid former." To Lavoisier is due the credit for the true explanation of combustion.—*Power.*

THE BAGDAD RAILWAY.—The future of the near East is obviously a matter of the greatest practical interest to Russia, which is thus directly interested in the Bagdad Railway. A committee formed under the auspices of the "Society of Slavonic Reciprocation" has been studying this matter, and has recently made a report. The committee urges that under the terms of peace the Turkish Black Sea coast should belong to Russia, and that the Bagdad Railway, as regards both the sections already constructed and the concession for the building of the remainder, should be taken from Germany. At first, it will be desirable for the railway to continue to be operated and developed under the joint administration of England, France and Russia, while the selection of new lines and the final determination of the route of trunk and subsidiary lines must depend not so much upon political interests as has hitherto been the case, but on the economic interests of the three allied powers. The report recommends that, from the standpoint of Russian commercial interests, the roundabout route from Biredjik to Bagdad, chosen by the Germans for strategic reasons, should be straightened out in the form of a line on the right bank of the Euphrates, which happens to be the British plan. It is obvious that the Bagdad Railway, whose commercial and military importance is being much more generally appreciated than was formerly the case, will in the near future become a political factor of much importance.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Rates on Iron Pipe Found Reasonable

City of Charlotte, N. C., et al. v. Southern Railway Company et al. Opinion by the commission:

Rates on cast-iron pipe in carloads from East Radford and Lynchburg, Va., and Anniston, Ala., to Charlotte, N. C., and Rock Hill, S. C., not found to have been unreasonable. Fourth section applications named granted in part and denied in part. (34 I. C. C., 128.)

Spokane Lumber Rates Reduced

Wilson-Leuthold Lumber Company et al. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Hall:

Rate of 20 cents per 100 lb. for the transportation of lumber in carloads from Spokane, Wash., to Butte, Mont., over the Northern Pacific and the Chicago, Milwaukee & St. Paul, found unreasonable. Reasonable maximum rate (17½ cents) prescribed for the future. (34 I. C. C., 146.)

Rates on Shingles to Points in Iowa

Board of Railroad Commissioners of Iowa v. Atchison, Topeka & Santa Fe et al. Opinion by the commission:

The commission finds that the present rates on cedar shingles from points in Oregon, Washington, Idaho and Montana to points in Iowa are discriminatory, and fourth section applications seeking authority to charge lower rates on this commodity from these points of origin named to Chicago and St. Louis than to intermediate points are denied. (34 I. C. C., 111.)

Westbound Transcontinental Refrigeration Charges

Opinion by the commission:

The commission finds that the carriers have not justified proposed new refrigeration charges on perishable commodities iced by the shipper and delivered to the carrier with specific notice not to re-ice in transit. Certain proposed increased charges per car for the re-icing in transit of perishable commodities shipped from Missouri river territory to the north Pacific coast, Spokane and Montana territories are, however, found to be justified. (34 I. C. C., 140.)

The Tap Line Case

Opinion by Commissioner Harlan:

The commission finds that joint rates on hardwood lumber from mills located on the Louisiana & Pine Bluff at Huttig, Ark., in excess of the rates on the same commodity from the station at Huttig on the rails of the St. Louis, Iron Mountain & Southern are unreasonable and discriminatory. The Louisiana & Pine Bluff is a subsidiary of the Frost-Johnson Lumber Company. The complainant is charged three cents a 100 lb. for the switching of the product of its mill to the Iron Mountain, a distance of but a few hundred feet to one connection and of less than three miles to another connection. (34 I. C. C., 116.)

Rates from Trebein and Leesburg, Ohio

Dewey Brothers Company v. Pittsburgh, Cincinnati, Chicago & St. Louis, et al. Opinion by the commission:

The commission finds that the maintenance of lower rates on grain and grain products from Trebein and Leesburg, Ohio, to Norfolk, Va., than to intermediate points west of and including Bluefield, W. Va., is not justified, and relief from the provisions of the fourth section of the act is denied. The rates from these points of origin to main-line points on the Norfolk & Western west of and including Bluefield are held unreasonable to the extent that they respectively exceed 15.4 and 14.9 cents per 100 lb. The rates to branch line points on the Norfolk & Western, both east and west of Bluefield are not shown to be unreasonable. (34 I. C. C., 135.)

STATE COMMISSIONS

The Illinois Public Utilities Commission has issued a decision holding that the "jitney bus" is to be considered as a public utility, and that proprietors must incorporate and seek certificates before operating.

The Illinois Public Utilities Commission held a hearing on Monday on the application of the Chicago & Milwaukee Electric Railroad for permission to increase its passenger fares from about 1.40 cents a mile to 1.75 cents.

The Colorado Public Utilities Commission has issued an order requiring railroads to file with the commission copies of their working time schedules, insofar as they affect the movement of passenger trains, and all changes therein at least five days before their effective date. It is also ordered that if any change is made in the time of arrival or departure of regular passenger trains, such information shall be posted in each station at least five days before the effective date. Notice to the commission is also required of the removal or abandonment of any station or agency at least ten days before the effective date.

PERSONNEL OF COMMISSIONS

William M. Brown, of Bangor, has been appointed chief inspector for the Public Utilities Commission of Maine, the appointment to take effect July 3. For seventeen years, up to 1912, Mr. Brown was superintendent or general superintendent of the Bangor & Aroostook. He was graduated from Bowdoin College in 1881 as civil engineer, and was engaged in the location and construction of several railroads in Maine between 1882 and 1895.

COURT NEWS

The judges of the United States district court at Detroit have declined to issue a temporary injunction at the request of the Ann Arbor, restraining the state of Michigan from enforcing the two-cent passenger fare law.

In the Federal Court at St. Louis, Mo., June 1, the Davidson Brothers Company of Des Moines, Ia., pleaded guilty to an indictment charging the presentation of fraudulent claims for damages to freight. Davidson Brothers are wholesale fruit dealers, and the offenses occurred in 1912.

Discrimination in Delivery from Spur Track

Under the Texas statute, defining and prohibiting unjust discrimination on the part of any railroad, the Court of Civil Appeals holds that a road, by refusing to deliver to one doing business on its spur track shipments from localities or persons not served by its own line, but by connecting lines, works an unlawful discrimination against such localities or persons that may be enjoined.—M. K. & T. v. Seeger (Tex.), 175 S. W., 713.

Texas Blacklisting Statute Held Unconstitutional

Following the decision of the Texas Supreme Court in St. Louis Southwestern v. Griffin, 171 S. W., 703, the Texas Court of Civil Appeals holds that the Texas blacklisting statute, requiring railroad companies to furnish discharged employees with a statement of the cause of their discharge, and to furnish employees voluntarily leaving the service with a statement to that effect showing whether their services were satisfactory, is unconstitutional. Galveston, H. & S. A. v. State (Tex.), 175, S. W., 1096.

Right to Relief from Passenger Service on Branch Lines

The North Dakota Supreme Court in a case against the "Soo Line," holds that in determining whether a railroad shall be granted relief under the North Dakota statute from maintaining a separate daily passenger service on a branch, the earnings and cost of operation of the branch line service must be determined as nearly as possible; and where it plainly appears that the cost of operating the branch line with separate daily passenger service installed greatly exceeded the road's revenues derivable from the operation of the branch line, the road is prima facie within the statutory exception, and prima facie is entitled to be permitted to operate a daily mixed passenger and freight train. A road cannot be compelled to operate a separate daily passenger service on a particular branch line at a great loss, and be compelled to make up such loss from its main line revenues. The intention of the statute is that the revenues from branch lines shall justify a daily passenger service independent of whether the road as a whole within the state is returning a fair dividend on its investment. In the present case the evidence showed that the Crosby-Berthold line of another company—the Great Northern—furnishes ample passenger service for four-fifths of the length of this line. It was held that a separate passenger service should not be forced for the convenience alone of the town of Ambrose and vicinity, when to do so would cause an additional annual expenditure of $14,000, added to a loss already sustained under mixed train service, the revenues being inadequate to meet even the expenses of a mixed train service. Minneapolis, St. P. & S. S. M. v. State Board (N. Dak.), 152 N. E., 513.

Exchange of Passes—Liability

The Indiana Appellate Court holds that passes exchanged between two interurban railroads for the use of their officers are supported by a valid "consideration," i. e., some right, interest or profit accruing to one party, or some detriment, inconvenience, loss, or responsibility given, suffered or undertaken by the other, and the stipulation for nonliability indorsed thereon cannot be enforced. Fort Wayne & Wabash Valley Traction Co. v. Justus (Ind.), 108 N. E., 754.

Safety Gates—Stop, Look, and Listen Rule

The Pennsylvania Supreme Court holds that, while safety gates are for the protection of the public, they do not absolve the public from exercising proper care to protect themselves. An automobile approached a crossing from the west, traveling 20 miles an hour, when it was 20 or 25 ft. from the crossing, the safety gates of which were raised. At that distance the chauffeur first saw a locomotive on the track, traveling 20 miles an hour. He made no effort to reduce his speed or stop the machine until he saw the engine. His machine was struck when it was at a standstill with its front part over the first rail of the northbound track. He was held to be guilty of contributory negligence barring recovery in not observing the stop, look, and listen rule. This rule has been enforced by the Pennsylvania courts since the decision in Pennsylvania Co. v. Beale, 73 Pa. 504, in 1873, and failure of a traveler to observe it is not mere evidence of negligence for the jury, but negligence per se and to be so declared by the court. Earle v. Reading (Pa.), 93 Atl., 1001.

Air Brakes—Switching Operations

Following the federal court's decision in United States v. Erie, C. C. A., 212 Fed. 853, where the question of the compulsory use of air brake equipment in switching operations was elaborately considered, the Pennsylvania Supreme Court holds that the safety appliance act does not compel the air coupling of cars in switching movements. Whalley v. Reading (Pa.), 93, Atl., 1016.

United States Steel Corporation Not Condemned

The United States Circuit Court of Appeals, at Trenton, N. J., June 3, handed down a decision refusing the application of the government for an injunction against the United States Steel Corporation as an organization maintained in violation of the anti-trust law. The decision, by Judge Buffington, is concurred in by Judges McPherson, Hunt and Woolley. Though unanimous in their decision, not all the members of the court are in complete accord as to the steps by which the result is reached.

As against the government the court refused to dissolve the corporation, holding that in acquiring its foreign and home trade the concern did not violate the Sherman anti-trust act; and it refused all the injunctions prayed for by the Department of Justice.

As against the Steel Corporation the court held that the committee meetings participated in by 95 per cent of the steel trade of the country, including the Steel Corporation, subsequent to the famous Gary dinners of eight or nine years ago, were unlawful combinations to control prices, but as these meetings had stopped before the government filed its complaint, in October,

1911, the judges held that there was no occasion for an injunction.

The opinion of the court suggests that such practices lie within the province of the new Federal Trade Commission, but adds that if their repetition is apprehended the court will on motion of the government retain jurisdiction of the case to deal with this feature.

Judge Buffington declares that the keynote of the entire opinion is "that this case, a proceeding under the Sherman anti-trust law, is largely one of business facts. . . . The real test of monopoly is not the size of that which is acquired, but the trade power of that which is not acquired. . . . If mere size were the test of monopoly and trade restraint, we have not one but half a dozen unlawful monopolies in the large department stores of a single city."

The court found nothing wrong in the Steel Corporation acquiring the Tennessee Coal & Iron Company during the financial panic in 1907. The output of the Tennessee Coal & Iron Company at the time was only 1.7 per cent of the country's total output; up to that time it had not been a business success; its principal product—rails—was made at a loss; its ultimate success was doubtful and involved a further outlay of $25,000,000, and the purchase of the Tennessee property, as well as that of several other steel concerns earlier in the history of the big corporation, was made in fair business course and was "the honest exertion of one's right to contract for one's benefit, unaccompanied by a wrongful motive to injure others."

With regard to Andrew Carnegie, who, the government charged, was a party to the "unlawful combination," and "took the bonds of the corporation with all the infirmities attaching to such participation," the court found that there is no proof that he accepted any other relation in the formation of the Steel Corporation than that of seller of his stocks and bonds.

On the filing of a formal decree the government will probably take an appeal to the Supreme Court.

Advance New York Suburban Fares Sustained

The New York State Court of Appeals on June 8 affirmed the decision of the Supreme Court, Appellate Division, handed down in January, 1914, approving an increase of fares, between New York City and points in Westchester county, made by the New York Central in 1910. The decision of the lower court was reported in the *Railway Age Gazette* January 30, 1914, pages 221 and 249. By this action the courts have reversed the decision of the Public Service Commission, second district, which had held that the very low rates formerly in effect should be continued as a matter of public policy; this conclusion, in an opinion by Chairman Stevens, having been reached in spite of the fact that no evidence was found showing the higher rates to be unreasonable in themselves.

The present decision is by Judge Hiscock, who says:

"The naked fact that a railroad has established and continued a rate for a limited time does not justify the conclusion that it was profitable. It may have been established at an unprofitable figure as a result of miscalculation, or because of compelling competition or of a policy which was willing to endure temporary losses in the hope that there might ultimately be developed a profitable traffic.

"In the second place, even if we should assume that these rates when established in 1907 were compensatory, the presumption did not follow that this condition and result would indefinitely continue."

The question what general policy should be adopted in developing suburban trade was one to be decided by the road and not by the state. The methods and rates which it would apply to the development of any policy were subjects for regulation, but the question whether the welfare of the road would be best subserved by one policy or another was a subject to be decided by the officers and stockholders of the corporation.

In April, 1914, the legislature passed a bill, applying both to the New York Central and to the New York, New Haven & Hartford (which has a similar suit pending) reducing the fares, in accordance with the view of the Public Service Commission; but this bill was vetoed by Governor Glynn, who, referring to the fact that the suit had been appealed to the higher court, declared that legislation to forestall a decision of the court was wholly unjustifiable.

The present decision foreshadows a similar conclusion in the New Haven road's case.

Railway Officers

Executive, Financial, Legal and Accounting

T. Cox has been appointed acting auditor of the Pacific & Idaho Northern, with headquarters at New Meadows, Idaho, succeeding H. W. Davies.

Samuel C. Stickney, assistant general manager of the Erie at New York, has been appointed assistant to vice-president of the Erie, the Chicago & Erie, the New York, Susquehanna & Western and the New Jersey & New York. Jason C. Tucker, assistant to general manager at New York, has been appointed assistant to vice-president, and John D. Cummin, assistant to general manager at New York, has been appointed assistant to vice president. All with headquarters at New York. The positions of assistant general manager and assistant to the general manager are discontinued. (See Operating Officers.)

John D. Cummin, whose appointment as assistant to the vice-president of the Erie has already been announced, was born October 11, 1870, at Babylon, New York. After a common school education he began railroad work on July 1, 1887, with the Long Island. Up to July 31, 1897, he held various positions under the general roadmaster, chief engineer and general superintendent, and for six of these years was in charge of work train service. From 1897 to 1901 he was out of railroad work, being superintendent of a news company. From 1901 to February, 1905, he was clerk and then chief clerk to the general superintendent, later the general manager, and later the vice-president of the Erie. From March to December, 1905, he was general agent of the Bath & Hammondsport Railroad and the Lake Keuka Navigation Company. From 1906 to August, 1909, he was assistant to the receiver of the Cincinnati, Hamilton & Dayton and Pere Marquette. In September, 1909, Mr. Cummin was appointed special agent in the vice-president's office of the Erie, and in January, 1914, assistant to the general manager.

Operating

T. E. Jamison has been appointed trainmaster of the Chicago division of the Baltimore & Ohio, with office at Garrett, Ind., succeeding D. F. Stevens, promoted.

O. C. Bishop has been appointed superintendent of sleeping and dining cars and news service of the Canadian Northern, western lines, with headquarters at Winnipeg, Man. J. M. Grieve has been appointed assistant superintendent of sleeping and dining cars and news service, with headquarters at Winnipeg, Man.

J. E. Snedeker, superintendent of the Central Kansas division of the Missouri Pacific-Iron Mountain System, has had his jurisdiction extended over the Colorado division, with headquarters at Osawatomie, Kan. A. J. Alexander, superintendent of the Colorado division, has been appointed assistant superintendent of the Horace district of the Colorado division, with headquarters at Pueblo, Colo. T. W. Collins has had his jurisdiction extended over the Hoisington district, with headquarters at Hoisington, Kan. R. E. Cahill has been appointed assistant superintendent of the Northern Kansas division, with headquarters at Concordia, Kan. The offices of assistant superintendent of the Kansas City and Northwestern district and the Leavenworth branch and of trainmaster of the Northern Kansas division have been discontinued.

Frederic B. Lincoln, general superintendent of the Erie and subsidiary lines east of Salamanca, at New York, has been appointed general manager of the Lines East of Buffalo and Salamanca, with office at New York. William A. Baldwin, assistant general superintendent at New York has been appointed general superintendent of Lines East of Buffalo and Salamanca, with office at New York. John B. Dickson, assistant general manager at Cleveland, Ohio, has been appointed general superintendent of Lines West of Buffalo and Salamanca, with office at Cleveland. George W. Kirtley, superintendent of transportation at New York, has been appointed general superintendent of transportation, and the offices of assistant general superintendent, Lines East, assistant general manager, Lines West, and superintendent of transportation, have been discontinued.

James Kerr McNeillie, whose appointment as general superintendent of the Canadian Government Railways, with headquarters at Moncton, N. B., has already been announced in these columns was born on February 23, 1874, at Toronto, Ont., and was educated in the public schools and at Collegiate Institute, Lindsay, Ont. He began railway work in May, 1890, with the Grand Trunk and served as call boy and apprentice at Lindsay, until November, 1891, then as apprentice, locomotive fitter and machinist at Point St. Charles. In September, 1896, he entered the service of the Canadian Pacific as clerk in the chief despatcher's office, and subsequently served as chief clerk in the superintendent's office, also in the general superintendent's office, and as car service agent until March, 1903. He was then passenger car distributor in the car service department at Montreal, until September, 1907, when he was appointed assistant superintendent of the Toronto Terminals. The following July he was appointed superintendent of District No. 1, Ontario division at Toronto, Ont., and in February, 1909, was transferred to London as superintendent of District No. 2. From March, 1911, to February, 1913, he was superintendent of District No. 1, Eastern division at Farnham, Que., and then to June, 1914, was superintendent of the Montreal Terminals. He was then appointed superintendent at Montreal of District No. 3, Eastern division, remaining in that position until May, 1915, when he left the service of the Canadian Pacific to go to the Canadian Government Railways as general superintendent of the Intercolonial, the Prince Edward Island and the National Transcontinental east of Quebec, with headquarters at Moncton, N. B.

J. K. McNeillie

Frederic Bowen Lincoln, who has been appointed general manager of the Erie Lines East of Buffalo and Salamanca, with office at New York City, was born in October, 1867, at New York, and was educated in the public schools and at New York University. He began railway work on May 20, 1887, in the enginering department of the Erie, and to June, 1892, was consecutively rodman, transitman and assistant engineer. He was then, for over three years, assistant engineer of the Allegheny and Susquehanna divisions, and from November, 1895, to May, 1897, was trainmaster of the Toby branch, in charge of maintenance and operation of the same road. In May, 1897, he became agent of the Erie at Salamanca, N. Y., and from December, 1898, to March, 1902, was superintendent of the Tioga division of the same road and superintendent of the Blossburg Coal Company. He was then, to October, 1903, general manager of the Buffalo & Susquehanna Coal & Coke Company, and from October, 1903, to the following February was special agent for the vice-president and general manager of the Erie. In February, 1904, he was appointed superintendent of the Susquehanna division of the Delaware & Hudson, remaining in that position until August, 1905, then for a short time he was superintendent of construction of the Delaware & Eastern. From October, 1905, to March, 1906, he was superintendent of construction of the O'Rourke Engineering Construction Company, New York, engaged on the New York Central & Hudson River terminal work, at Forty-second street, New York. On March 15, 1906, he became assistant to the receiver of the Pittsburg, Shawmut & Northern; in January, 1914, he was appointed general superintendent of the Erie grand division of the Erie, and now becomes general manager of the Lines East of Buffalo and Salamanca of the same road.

F. B. Lincoln

M. A. Mulligan, whose appointment as superintendent of the New York division of the Lehigh Valley has been previously announced in these columns, began railway work on that road as water boy for a track gang. He was later brakeman, conductor and then fireman. He left the Lehigh Valley to take a position as fireman on the Erie, and previous to 1910 filled the positions of yardmaster, and later general yardmaster of the New York terminals of the Erie. In December, 1910, he returned to the Lehigh Valley as general yardmaster of the New York division, and later was made trainmaster of that division. Some months ago he was appointed general yard inspector, making a study of the condition of all the larger yards on the system. He has now been appointed superintendent of the New York division, as noted above.

M. A. Mulligan

Traffic

F. B. McIlvaine has been appointed district freight claim agent of the Michigan Central, with headquarters at Chicago.

Engineering and Rolling Stock

T. L. Landers has been appointed resident engineer of the Intercolonial, with office at Truro, Nova Scotia.

W. H. Keller, assistant master mechanic of the Baltimore & Ohio Southwestern, at Cincinnati, Ohio, has been appointed master mechanic of the Indiana division, with headquarters at Cincinnati.

E. W. McGarvey has been appointed assistant supervisor of the Philadelphia division of the Eastern Pennsylvania grand division of the Pennsylvania Railroad, succeeding J. R. Scarlett, transferred.

John Ernest Lloyd, assistant division engineer of the Baltimore & Ohio, at Garrett, Ind., has been appointed division engineer, with headquarters at Cleveland, Ohio, succeeding A. A. Jackson, resigned.

B. B. Milner has been appointed engineer of motive power of the New York Central, in charge of locomotive design and construction, and the relation of locomotive standards to operation, with headquarters at New York.

Lee Highley, chief engineer of the Pacific & Idaho Northern, having resigned, the office of chief engineer is abolished for the time being. All correspondence regarding the engineering department should be addressed to the general manager.

E. N. Layfield, formerly chief engineer of the Chicago Terminal Transfer Railway, and more recently a consulting engineer at Chicago, has been appointed assistant secretary and editor of publications of the Western Society of Engineers, Chicago.

P. Alquist, superintendent of the car department of the Missouri, Kansas & Texas at Sedalia, Mo., has been appointed general superintendent of the car department, with office at Dennison, Tex. William Walker, general foreman of the Sedalia shops succeeds Mr. Alquist.

A. F. Dorley, whose appointment as engineer of maintenance of way of the eastern district of the Missouri Pacific-Iron Mountain System, with headquarters at St. Louis, Mo., has already been announced, was born on April 8, 1875, at Lancaster, Pa. He was graduated from Mt. St. Mary's College, Emmitsburg, Md., in 1893, with the degree of A. B., and from Notre Dame University, South Bend, Ind., in 1900, with the degree of C. E. He entered railway service on June 21, 1900, and was rodman for the Baltimore & Ohio Southwestern until February 1, 1901, when he became assistant engineer of the Cleveland, Cincinnati, Chicago & St. Louis, at Indianapolis, Ind. From February 1, 1902, to April 1, 1903, he was assistant engineer of the Baltimore & Ohio Southwestern, at Chillicothe, Ohio. He was then made assistant division engineer at Washington, Ind., which position he held until April 1, 1906, when he came to the Missouri Pacific-Iron Mountain System as assistant engineer. From July 15, 1906, to December 10, 1910, he was consecutively division engineer at Kansas City, Mo., Osawatomie, Kan., and Omaha, Neb. On December 10, 1910, he was appointed engineer of water service, with office at St. Louis, Mo., and on April 1, 1914, was appointed principal assistant engineer, with headquarters at St. Louis, from which position he is now promoted.

A. F. Dorley

Purchasing

A. E. Hutchinson has been appointed general purchasing agent of the Oregon Short Line, with headquarters at Salt Lake City, Utah, succeeding G. H. Robinson, who has been appointed general storekeeper at Pocatello, Idaho, succeeding T. A. Martin, promoted.

OBITUARY

N. A. Waldron, general storekeeper of the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., died in St. Louis, Mo., on May 30.

E. N. Brown, assistant superintendent of the Baltimore & Ohio Southwestern, at Chillicothe, Ohio, died in that city May 25, at the age of 46 years.

H. W. Cowan, chief engineer of the Colorado & Southern, whose death on May 29, at his home in Denver, Col., has already been announced, was born on April 27, 1862, at Bath, Me. After graduating from the Worcester Polytechnic Institute he entered railway service, and from 1883 to 1886 he was topographer and draftsman for the Winona, Alma & Northern. From June, 1886, to September, 1888, he was draftsman and topographer for the Colorado Railway, and from September, 1888, to February, 1894, was assistant engineer of the Colorado division of the Union Pacific. He was then appointed resident engineer of the Union Pacific, Denver & Gulf and the Denver, Leadville & Gunnison railways, at Denver, Col. In January, 1898, he was appointed chief engineer of the Colorado & Southern, successor to the Union Pacific, Denver & Gulf and Denver, Leadville & Gunnison Railways, and in January, 1907, was also appointed consulting engineer of the Colorado & Southern, and was later appointed chief engineer.

Equipment and Supplies

LOCOMOTIVE BUILDING

THE DENVER & SALT LAKE has ordered eight Mikado type locomotives from the Lima Locomotive Corporation.

THE NEW YORK, ONTARIO & WESTERN has ordered 12 Santa Fe type locomotives, cylinders 28 by 32 in., driving wheels 57 in., total weight in working order 360,000 lb., from the American Locomotive Company.

CAR BUILDING

THE LEHIGH VALLEY is making inquiries for twenty 50-ft. steel underframe milk cars.

THE INTERNATIONAL & GREAT NORTHERN is negotiating for 1,000 cars, with the Mt. Vernon Car Company.

THE NORFOLK & WESTERN has ordered 10 coaches from the Harlan & Hollingsworth Corporation, and 12 baggage and express cars and 2 postal cars from the American Car & Foundry Company.

IRON AND STEEL

THE CHESAPEAKE & OHIO NORTHERN has placed an order for 2,000 tons of bridge material.

THE LEHIGH VALLEY has ordered 100 tons of steel from the American Bridge Company, for a turntable.

THE LOUISVILLE, HENDERSON & ST. LOUIS has ordered 3,000 tons of rails from the Illinois Steel Company.

THE CHESAPEAKE & OHIO has ordered 2,100 tons of bridge material from the Virginia Bridge & Iron Company.

THE VIRGINIAN RAILWAY has ordered 240 tons of bridge material from the Virginian Bridge & Iron Works.

THE LEHIGH VALLEY has ordered 2,000 tons of steel from the American Bridge Company for train shed and grade crossing work.

THE CHICAGO, MILWAUKEE & ST. PAUL has awarded a contract for 359 tons of steel for a bridge at Tacoma, Wash., to the American Bridge Company.

THE ST. LOUIS & SAN FRANCISCO has been authorized by Judge Sanborn in the Federal Court to spend $800,000 for rails for replacements on various portions of the system.

THE CHICAGO, INDIANAPOLIS & LOUISVILLE has ordered 3,000 tons of rails from the Illinois Steel Company. This order was prematurely reported in our issue of May 7.

THE PENNSYLVANIA LINES WEST has ordered 300 tons of steel for elevated track work at Fort Wayne, Ind., from the Riter-Conley Manufacturing Company, Leetsdale, Pa.

THE PENNSYLVANIA LINES EAST AND WEST OF PITTSBURGH has placed orders for 155,500 tons of rails. The orders call for 118,000 tons of 100-lb. rail and 37,500 tons of 125-lb. rail. An order for 12,000 tons had previously been placed, so that the present order makes the total Pennsylvania rail orders for the present year 167,500 tons.

MACHINERY AND TOOLS

THE MISSOURI PACIFIC-IRON MOUNTAIN SYSTEM has purchased four wood-working tools for its repair and machine shops at Pueblo, Colo.

THE GULF, COLORADO & SANTA FE contemplates the purchase of the following new machinery at its shops at Cleburne, Tex.: One 4-ft. 8-in. by 8-ft. sash and door clamp; one 15-hp. power motor; one 22-in. by 12-ft. engine lathe; one ⅛-in. to 3½-in. twist drill wet grinder; one 4-in. pipe threading machine and one 28-in. rigid turret lathe. New machinery contemplated at Galveston, Tex., consists of one 24-in. crank shaper and one 26-in. by 14-ft. engine lathe.

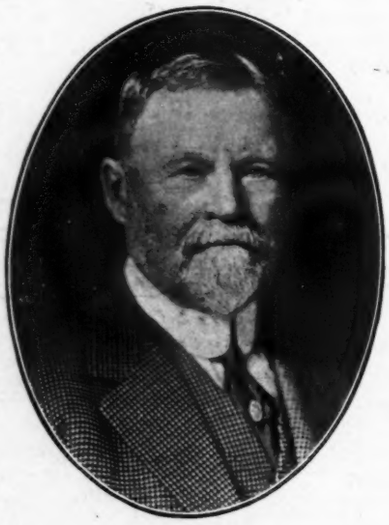
Supply Trade News

The Union Twist Drill Company, Athol, Mass., is reported to have received a large order for rifles.

The Standard Underground Cable Company has begun the erection of an addition at Perth Amboy, N. J., to be used for drawing brass wire and copper tubing.

At a special meeting of the stockholders of the Burd High Compression Ring Company, Rockford, Ill., held on May 19, it was unanimously voted to increase the capital stock from $50,000 to $200,000. It was announced that the additional capital was voted because of large contracts which the company has been receiving and for the purpose of adding to equipment and enlarging the business.

C. H. Morse, Sr., the retiring president of Fairbanks, Morse & Company, who is being succeeded by his son, C. H. Morse, Jr., as has already been announced, was born in St. Johnsbury, Vt., in September, 1833. He began his business career at the age of 17, when he became clerk in the office of E. & F. Fairbanks & Co., scale manufacturers. In 1862 he became a member of the firm of Fairbanks, Greenleaf & Company, successors to E. & F. Fairbanks & Co. In 1872 the firm of Fairbanks, Morse & Company was established, Mr. Morse, Sr., being elected president, which position he held until May 19, when he resigned.



C. H. Morse, Sr.

J. B. Evans, recently with the General Railway Signal Company of Canada, Ltd., and formerly with the General Railway Signal Company, Rochester, N. Y., has been appointed general manager of the National Concrete Machinery Company, Madison, Wis. This company manufactures machinery for the production of concrete fence posts, and has a number of plants located on several of the large railways.

A. S. Hill, who was for a number of years at the head of Wm. E. Hill & Co., Kalamazoo, Mich., manufacturers of heavy saw mill machinery, has become connected with the American Saw Mill Machinery Company, Hackettstown, N. J., as the manager of the heavy saw mill department. It is the intention of the American Saw Mill Machinery Company to greatly amplify their line of heavy duty machinery under the supervision, designs and patents of Mr. Hill.

Six representatives of the Russian government, Maximillian Groten, Michael Bronikovfky, Michael Jurin, Nicolai Kemmer, Victor Kofhkin and Arcady Martynoff arrived in New York last Friday on the Norwegian-American liner Bergensfjord for the purpose of making a tour of the United States and Canada to inspect the supplies, including railroad equipment and other material, recently ordered by the government. The commission of six inspectors will spend two weeks in New York, after which they will visit various manufacturing centers. They expect to stay on this continent about six months.

The Baldwin Locomotive Works is reported to have entered into a contract with the Remington Arms & Ammunition Company, whereby the locomotive company will turn over to the ammunition company certain new shops, the construction of which was recently started at Eddystone, for the manufacture of 1,500,000 rifles on an order from the Russian government. The ammunition company, according to the reports, will make the rifles, paying the Baldwin Locomotive Works a royalty of $1 on each rifle made, and at the completion of the order will turn the plant and equipment, valued at $1,500,000 over to the locomotive company, whereby the latter will have made $3,000,000 on the contract.

The business of the Wells Light Manufacturing Company, Jersey City, N. J., has been acquired by the Alexander Milburn Company, Baltimore, Md., manufacturers of high power portable lights and oxy-acetylene welding apparatus. Repair parts for Wells lights will be manufactured and supplied in the future by the Alexander Milburn Company from its Baltimore factory, and complete Wells oil lights will also be furnished where desired, in conjunction with the standard Milburn acetylene lights. The manufacture of Wells oil preheating burner outfits will be continued by the company and sold in connection with Milburn oxy-acetylene apparatus. The Wells lights and Wells preheating devices have been on the market for about 20 years, and have occupied a leading place among oil-burning equipment of their kind.

C. H. Morse, Jr., who has been elected president of Fairbanks, Morse & Company, succeeding his father, C. H. Morse, Sr., as has already been announced, is 41 years old. He was graduated from the University of Michigan in 1895, as a mechanical engineer. He first entered one of the Fairbanks, Morse & Company shops in order to get a practical knowledge of the building of gas engines, pumps, etc. He has been president of the Fairbanks, Morse Manufacturing Company, Beloit, Wis., in charge of manufacturing, for 10 years, which position he still holds. He has also been a director of Fairbanks, Morse & Company, Chicago, for 15 years, a director of Fairbanks, Morse Elecal Manufacturing Company, Indianapolis, Ind., for eight years. Eight years ago Mr. Morse was also elected a director of the Canadian Fairbanks, Morse Company for eight years.

C. H. Morse, Jr.

TRADE PUBLICATIONS

Building Construction.—H. Edsil Barr, mechanical engineer, Erie, Pa., has issued a booklet describing his system of construction for warehouses, factories and industrial buildings. This form of construction, for which great economy is claimed, consists of concrete foundation, structural steel framework and brick pilasters with large window areas equipped with steel sash.

Insulators.—A recently issued 12-page pamphlet by the Brookfield Glass Company, New York, gives a brief list of insulators and insulator pins forming a part of its line of these products. Complete dimensions and specifications are given for each item. A more complete list of the products of this company is contained in its bulletin No. 56, which will be supplied upon request.

Chimneys.—The Weber Chimney Company, Chicago, has issued a 48-page booklet describing its reinforced concrete chimneys and showing a large number of chimneys completed and in course of construction. It also contains a list of places where Weber chimneys have been erected throughout the United States and Canada with dimensions, and contains Kent's table of chimney sizes for steam boilers.

Air Compressors.—Bulletin No. 34M, dated March, 1915, and issued by the Chicago Pneumatic Tool Company, describes the class O Chicago pneumatic steam and power driven compressors. The bulletin contains 36 pages, including detailed illustrations of the various parts of these compressors, as well as indicator diagrams showing the results obtainable by their use. Tables are included giving the principal data for the various sizes.

ELEVATED STEEL WATER TANKS.—The Pittsburgh-Des Moines Steel Company, Pittsburgh, formerly the Des Moines Bridge & Iron Company, has issued a booklet describing its exhibit at the Panama-Pacific International Exposition, San Francisco. This booklet also contains a number of photographs and descriptions of installations of tanks for railway and other purposes. A list of tank installations with capacity and height is included.

STEEL REINFORCEMENT.—"Hy-Rib" is the title of a 144-page book issued by the Trussed Concrete Steel Company, Youngstown, Ohio, which contains a large amount of data showing the use of this steel sheathing in building constructions of various kinds. The book is well illustrated with a large number of photographs and drawings of representative structures in which this material has been incorporated, and should be of interest to the engineer and architect.

HEAT INSULATION.—A four-page folder recently issued by the Armstrong Cork & Insulation Company, Pittsburgh, Pa., deals with that company's high pressure covering for use on high pressure and superheated steam lines, boilers and other heater surfaces. This material is made up of a special form of silica of a minute cellular construction mixed with asbestos. Owing to the cellular nature of the silicious material it is said to be an exceptionally good heat insulator.

SPEED REDUCING GEAR.—Catalog A of the Turbo-Gear Company, Baltimore, Md., is devoted to the Turbo reducing gear recently developed by this company for high ratio speed reduction. This gear consists of a stationary annular gear, a pinion cut integral with the high speed shaft, between which operate the intermediate gears, the shafts of which are secured to the cast steel close feed members. All the gears are of a double helical type and are enclosed in a cast iron housing.

LOCOMOTIVE STOKERS.—The Locomotive Stoker Company, Schenectady, N. Y., in its catalogue No. 14-B, issued in April, 1915, has compiled a list of locomotives to which the Street stoker has been applied. The catalogue is a neatly arranged booklet of some 50 pages, containing full-page illustrations of the locomotive classes, the principal dimensions, the number stoker fired in each case being shown on pages facing the illustrations. The catalogue brings out the fact that at the present time there are in service over 600 locomotives fired by Street stokers.

SECTIONAL STEEL BUILDINGS.—A loose-leaf catalog recently issued by the C. D. Pruden Company, Baltimore, Md., is devoted to the line of portable and permanent sectional steel buildings designed and manufactured by this company. These buildings include garages, cottages and a variety of portable buildings suitable for construction camp and other temporary purposes. The buildings are fireproof and may be amply lighted and ventilated. Standard sizes are carried in stock for immediate shipment.

INTERCOLONIAL RAILWAY OF CANADA.—The passenger department of the Canadian Government Railways has recently issued three exceedingly attractive folders relative to the scenic and other attractions of travel on the Intercolonial and the Prince Edward Island Railways. These booklets are entitled respectively; La Baie de Chaleur, Bras d'Or Lakes (Cape Breton), and "Abegweit." All three contain much interesting information and are well illustrated. The last, "Abegweit," deals with Prince Edward Island. It terms that island a "million acre farm," and says that although it does not now have a population as large as many Canadian cities, it could, nevertheless, on its 1,398,000 acres, support a population of over two million people. A fourth booklet, also of recent issue, names the 1915 summer excursion fares.

SOUTH AFRICAN NOTES.—The board of the South African Railways in a recent report says that during the past five years 1,446 miles of railway have been added to the South African system, representing an increase of over 20 per cent. The mileage at the end of last year was 8,486. In addition there are 647 miles of lines operated, but not owned by the administration. In 1910 the train mileage was 23,580,846, as against 29,701,991 in 1914, an increase of 6,121,345 train miles, or 25.9 per cent. There were under construction on December 31 last 973 miles of railway, the construction of all the lines sanctioned by Parliament having been started.

Railway Construction

ALABAMA GREAT SOUTHERN.—The new double track between Cuba, Ala., and Toomsuba, Miss., eight miles, has just been placed in service on the Alabama Great Southern. This track is to be used jointly by trains of the Alabama Great Southern and the Southern Railway.

CAROLINA, GREENEVILLE & NORTHERN (Electric).—Contractors have started work near Rader, Tenn., it is said, on this line. The plans call for building from Kingsport, Tenn., southwest, to Newport, about 75 miles, and there will be five steel bridges on the line. The company has under consideration the question of building an extension from Kingsport, east to Bristol, also an extension from Newport west to Knoxville. H. S. Reed, president, 205 Grant building, Los Angeles, Cal., and F. A. H. Kelly, chief engineer, Greeneville, Tenn. (January 19, p. 350).

CHARLESTON INTERURBAN.—This company has secured $750,000 through a sale of notes, it is said, and the proceeds are to be used for building the projected extension of the Kanawha Valley Traction from Charleston, W. Va., southeast via Marmet, Paint Creek, Cabin Creek, Coalburg and Handley to Montgomery, about 25 miles. Track has already been laid on about two miles. (March 12, p. 493.)

KENT COAL & RAILWAY COMPANY.—This company has been incorporated in New Brunswick, to build from Rexton, N. B., southwest to a point on the Intercolonial between Kent Junction and Adamsville, thence via Chipman to Minto, about 80 miles; also to build from Rexton to Richibucto Head. Inches & Hazen, solicitors, Fredericton, N. B. (April 23, p. 914.)

MCCONNELLSBURG & FT. LOUDON (Electric).—An officer writes that a contract has been let to Bennett & Smith, Greensburg, Pa., for the grading, track laying, etc., on the line from McConnellsburg, Pa., east to Ft. Loudon, 11 miles, and work is now under way. E. J. Post, president, McConnellsburg, Pa. (May 21, p. 1099.)

MERIDEN, NEW BRITAIN & HARTFORD (Electric).—Work is to be started at once, it is said, on a line between Meriden, Conn., and Hartford, about 20 miles. Mayor D. J. Donovan, Meriden, is said to be interested.

NORTH CAROLINA TRACTION.—An officer writes that this company will let contracts July 1 for building the projected line from High Point, N. C., via Winston-Salem to Christiansburg, Va., a distance of 137 miles. The work calls for the handling of about 300,000 cu. yd. of earth and about 63,000 cu. yd. of rock. There will be two steel bridges and a 21,897 ft. trestle and one 600 ft. tunnel. The company expects to develop a traffic in tobacco, timber and coal. B. D. Hammond, Box 21, Station A, Boston, Mass., is president.

SALT LAKE & UTAH (Electric).—This company, it is said, will open the line now under construction from Provo, Utah, to Springfield in July, and plans are under consideration for the immediate construction of the proposed extension to Payson.

TEXAS ROADS.—The construction of a railroad from Dallas, Tex., northwest to Wichita Falls, is contemplated by A. A. Green, Jr., H. D. Lindsley and others. A tap line will first be built between Denton on the Missouri, Kansas & Texas of Texas, and Krum on the Gulf, Colorado & Santa Fe, and trackage rights will be secured over the Missouri, Kansas & Texas of Texas between Denton and Dallas.

WAYCROSS & WESTERN.—This company is considering the building of an extension from Milltown, Ga., its present southern terminus, to Ray's Mill, where a connection will be made with the Georgia & Florida.

WEST VIRGINIA ROADS (Electric).—According to press reports plans are being made to build an electric line between Fayette, W. Va., on the Chesapeake & Ohio and Beckley, about 35 miles. H. G. Scott, Charleston, W. Va., is said to be interested.

RAILWAY STRUCTURES

Chicago, Ill.—The Atchison, Topeka & Santa Fe has applied to the city council for the vacation of several streets and alleys to permit the construction of its proposed fruit terminal, located about one mile from the center of population of the city, between Sixteenth street, Wentworth avenue, Archer avenue, Twenty-second street and Grove street, along the south branch of the Chicago river. It is proposed to construct a banana warehouse, a fruit auction house and a large cold storage warehouse. In a letter to the local industries committee of the city council, President Ripley says of the plan that facilities will be open to the general shipping public and also will be made available to other carriers entering the city for the handling of perishable freight at the usual charge for such service, thereby enabling the receiver, if he so desires, to concentrate his business at one place.

Chicago, Ill.—The Chicago & North Western is having plans prepared for a new four-story office building to cost about $250,000, at the northeast corner of Ravenswood Park and Lawrence avenue, to accommodate some of the offices of the accounting department which are now located in the company's main office building downtown.

Chicago, Ill.—The Union Station Company, Chicago, has awarded contracts for the Monroe street bridge substructure to the Fitzsimons-Connell Dredge & Dock Company, Chicago, and for the superstructure to the Kettler-Elliot Erection Company, Chicago.

Kansas City, Mo.—The Chicago, Burlington & Quincy will replace its present bridge at this place with a double decked structure. The Union Bridge & Construction Company has been awarded the contract for the substructure.

Kiowa, Kans.—The Atchison, Topeka & Santa Fe is constructing a passenger depot at this place. It will be brick with stucco finish and tile roof. Swanson & Sons, Topeka, Kan., have been awarded the contract. The estimated cost of the depot is $18,000, and the track changes will amount to about $10,000.

Phoenixville, Pa.—The Pennsylvania Railroad has asked bids on a concrete arch bridge at Campbell's Crossing, west of Frick's lock. The bridge is to consist of seven 84-ft. concrete arches for double track to take the place of the single-track four-span bridge now being used.

St. Paul, Minn.—The Chicago, St. Paul, Minneapolis & Omaha has awarded a contract to the Milwaukee Bridge Company, Milwaukee, Wis., for the superstructure of a counter balanced swing span 260 ft. long, with the long arm 175 ft. long. This is a bridge used jointly with the Chicago, Milwaukee & St. Paul, at St. Paul, over the Mississippi river. The contract for the deck plate girder spans was let some time ago. H. Rettinghouse, St. Paul, Minn., is chief engineer of the Chicago, St. Paul, Minneapolis & Omaha.

Railway Construction in Sweden.—A new railroad connection has been proposed between Goteborg and the province of Ostergotland, Sweden, on the Baltic. The connection will be made over an existing line from Goteborg via Boras, the cotton manufacturing center, to Halldarp. From Halldarp two new lines have been surveyed to Sommen, in Ostergotland. The two proposed lines coincide on the west side between Halldarp and Hoppebo, and on the east side between Sommen and Ostena. Between Hoppebo and Ostena one survey, known as the Jonkoping line, runs along the southern bank of Lake Vettern and through the town of Husqvarna and connects with Jonkoping, two important iron manufacturing centers. The other survey, the Tenhult line, runs through Lekeryd and Tenhult. The Jonkoping line, 88 miles in length, would cost $4,448,800 to build, or $935,320, more than the Tenhult line, because the grades are steeper and a narrow-gage line from Kojnoping to Gripenberg would have to be purchased and reconstructed. Either route would shorten the existing connection between Goteborg and the province of Ostergotland by about 30 miles. At present work is in progress to eliminate several sharp curves on the line from Goteborg to Boras, at an estimated cost of $804,000.

Railway Financial News

Erie.—The Wall Street Journal says that the directors of the Erie have decided to furnish the stockholders with full information concerning the company's coal properties. An inventory will shortly be made of these properties and the results put before the stockholders.

Missouri Pacific.—It is said that the reorganization plan contemplates the consolidation of the Missouri Pacific proper and the St. Louis, Iron Mountain & Southern, and the probable elimination of the St. Louis, Iron Mountain & Southern stock, which stock is now held by the Missouri Pacific. An issue of preferred stock may be made, to be exchanged for collateral trust bonds which are now secured by a like amount of St. Louis, Iron Mountain & Southern stock; and a stock assessment of $30 per share may be made, for which consenting stockholders will be given new preferred stock.

National Railways of Mexico.—As announced in these columns last week the $28,322,660 due June 1, including the principal of two year notes and interest maturities has not been paid. A formal announcement by the company says that owing to the continuance of the disturbing conditions in Mexico, it has been impossible for the company to make any arrangements for the payment of these obligations at this time. The operation of the property of the company is out of its hands. Holders of maturing obligations are asked to await the return to it of properties belonging to the system and the restoration of business to the Mexican nation, so that "the government and the company may be placed in a position to duly deal with the subject."

New York, New Haven & Hartford.—See President Elliott's statement in regard to the New Haven situation printed elsewhere in this issue.

Pennsylvania.—The leasing of all the property and franchises of the Pennsylvania & Atlantic to the Pennsylvania Railroad has been approved by the New Jersey Board of Public Utilities Commissioners. The lease was dated April 14, 1915, and provided that it may be terminated at any time upon 60 days' notice in writing from either party.

Wabash.—It has been announced that more than 90 per cent of the $40,600,000 first refunding and extension mortgage bonds have been deposited under the reorganization plan, and the time for the deposit of these bonds has been extended to July 3.

Opening of the Mont d'Or Tunnel to Switzerland.—A new railway link between France, Switzerland and Italy—the Frasne-Vallorbe Railway, including the Mont d'Or tunnel through the Jura—was opened for traffic on Sunday, May 15, without any ceremony, the only railway officers present on the occasion being those of the Paris-Lyons-Mediteranean Company and the Swiss Federal Railways. Work has begun in September, 1910, and was expected to be completed in May, 1914, but was seriously delayed mainly by water-bursts in the tunnel, and also by the difficulty of obtaining a solid foundation for the embankment near Frasne. The original estimate for line and tunnel was $7,400,000, but the actual cost was about $6,437,250 a mile. The new line is about 15 miles in length, 13½ miles of which is in France and 1½ miles in Switzerland. It branches off from the Dijon-Pontarlier line at Frasne, and penetrates the Mont d'Or by a tunnel 6,670 yards long, joining the Pontarlier-Lausanne line at Vallorbe. By avoiding the circuitous route via Pontarlier the new line shortens the distance between Paris and Lausanne by nearly 10 miles, while other improvements have resulted in a gain of from 45 to 60 minutes in the journey between the same points, with a consequent quickening of the Paris-Simplon-Milan service. The curves of the new line are favorable for speed, and, in winter, the tunnels and pine forests are a protection against snowstorms. Vallorbe has become a customs station, and has been entirely remodeled, so that trains can now enter and leave without the engines having to be uncoupled and reversed.